EMITECH GROUPE

RR051-17-100994-1-A Ed. 0

Certification Radio test report

According to the standard:
CFR 47 FCC PART 15

Equipment under test:
Wirnet iFemtoCell 915

FCC ID:
2AFYS-KLK915WIFC

Company:
KERLINK

Distribution: Mr LEMOINE **(Company:** KERLINK)

Number of pages: 58 with 8 appendixes

Ed.	Date	Modified Page(s)	Technical Verification and Quality Approval Name and Function	Visa
0	21-Sep-17	Creation	M. DUMESNIL, Radio Technical Manager	

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This document is the result of testing a specimen or a sample of the product submitted. It does not imply an assessment of the conformity of the whole manufactured products of the tested sample.

DESIGNATION OF PRODUCT:	**Wirnet iFemtoCell 915**
Serial number (S/N):	735BRc030015
Reference / model (P/N):	Wirnet iFemtoCell 915
Software version:	3.1.3
MANUFACTURER:	KERLINK

COMPANY SUBMITTING THE PRODUCT:

Company:	KERLINK
Address:	1 RUE JACQUELINE AURIOL 35235 THORIGNE-FOUILLARD FRANCE
Responsible:	Mr LEMOINE
DATES OF TEST:	From 8-Sep-17 to 12-Sep-17
TESTING LOCATION:	EMITECH ANGERS laboratory at JUIGNE SUR LOIRE (49) FRANCE FCC Accredited under US-EU MRA Designation Number: FR0009 Test Firm Registration Number: 873677
TESTED BY:	T. LEDRESSEUR
WRITTEN BY:	T. LEDRESSEUR

VISA:

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1. INTRODUCTION

This document presents the result of RADIO test carried out on the following equipment: **Wirnet iFemtoCell 915** in accordance with normative reference.

The product is a LoRa gateway composed by a LoRa function not certified and a Wi-Fi 2.4 GHz module already certified.
This radio test report concern only the test realized in order to certify the LoRa function, CFR47 FCC subpart C (§15.247).

The tests realized for subpart B (Wi-Fi integration and LoRa reception) or collocation measure are reported in radio test report RR051-17-100994-3-A.

2. PRODUCT DESCRIPTION

Class: B

Utilization: Residential use

Antenna type and gain: External antenna, connector RP-SMA and gain 3dBi (TEKFUN_I50-SR-W)

Frequencies plan

Transmitter

Channel frequencies	LoRa bandwidth (KHz)	Number of channel	Channel width (KHz)
923,3+i*0,6MHz (i=0 to 7)	500	8	600

Freq (MHz)	Frequencies tested for Transmission				
	MHz	CH Number	Channel width (KHz)	LoRa BW (KHz)	SF
923-928	**923.3**	**DL0**	**600**	500	7 & 12
	925.1	**DL3**	**600**	500	7 & 12
	927.5	**DL7**	**600**	500	7 & 12

Receiver

Channel frenquencies	LoRa bandwidth (KHz)	Number of channel	Channel width (KHz)
902,3+i*0,2MHz (i=0 to 63)	125	64	200
903,0+i*1,6MHz (i=0 to 7)	500	8	600

Freq (MHz)	Frequencies tested for Reception				
	MHz	CH Number	Channel width (KHz)	LoRa BW (KHz)	SF
902-915	**902.3**	**UL0**	**200**	125	7 & 10
	908.5	**UL31**	**200**	125	7 & 10
	914.9	**UL63**	**200**	125	7 & 10
902-915	**903**	**UL64**	**600**	500	7 & 12
	907.8	**UL67**	**600**	500	7 & 12
	914.2	**UL71**	**600**	500	7 & 12

Modulation: LoRa

Power source: 120 Vac – 60 Hz by AC/DC adapter

During test the output power was adjusted at the maximal level with the following setting (Mix 15 Pa 3)

Power level, frequency range and channels characteristics are not user adjustable.
The details pictures of the product and the circuit boards are joined with this file.

3. NORMATIVE REFERENCE

The standards and testing methods related throughout this report are those listed below.
They are applied on the whole test report even though the extensions (version, date and amendment) are not repeated.

CFR 47 FCC Part 15	Radio Frequency Devices
ANSI C63.4	2014 Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
ANSI C63.10	2013 Procedures for ComplianceTesting of Unlicensed Wireless Devices.
558074 D01 DTS v04	Guidance for Performing Compliance on Digital Transmission Systems Operating under §15.247
447498 D01 General RF Exposure Guidance v06	RF Exposure procedures and equipment authorization policies for mobile and portable equipment

4. TEST METHODOLOGY

Radio performance tests procedures given in CFR 47 part 15:

Subpart C – Intentional Radiators

- Paragraph 203: Antenna requirement
- Paragraph 205: Restricted bands of operation
- Paragraph 207: Conducted limits
- Paragraph 209: Radiated emission limits; general requirements
- Paragraph 212: Modular transmitter
- Paragraph 215: Additional provisions to the general radiated emission limitations
- Paragraph 247: Operation within the bands 902-928 MHZ, 2400-2483.5 MHz and 5725-5850 MHz

5. TEST EQUIPMENT CALIBRATION DATES

Emitech Number	Model	Type	Last verification	Next verification	Validity
0	BAT-EMC V3.6.0.32	Software	/	/	/
1406	EMCO 6502	Loop antenna	13/04/2017	13/04/2019	13/06/2019
4088	R&S FSP40	Spectrum Analyzer	29/10/2015	29/10/2017	29/12/2017
4393	Wainwright WLJS800-C11/60EE	Low Pass Filter	05/04/2016	05/04/2018	05/06/2018
6609	Hewlett Packard HPM11630	High Pass Filter	20/06/2016	20/06/2018	20/08/2018
7011	California Instruments MX45-3PI-MB-LAN-ES-HF-HV	Power source	04/08/2017	04/08/2018	04/10/2018
8511	HP 8447D	Low-noise amplifier	28/11/2016	28/11/2017	28/01/2018
8526	Schwarzbeck VHBB 9124	Biconical antenna	12/06/2015	12/06/2018	12/08/2018
8528	Schwarzbeck VHA 9103	Biconical antenna	15/03/2016	15/03/2019	15/05/2019
8535	EMCO 3115	Antenna	10/02/2016	10/02/2020	10/04/2020
8543	Schwarzbeck UHALP 9108A	Log periodic antenna	12/06/2015	12/06/2018	12/08/2018
8593	SIDT Cage 2	Anechoic chamber	/	/	/
8635	R&S EZ-25	High-pass filter	27/10/2016	27/10/2018	27/12/2018
8707	R&S ESI7	Test receiver	07/06/2016	07/06/2018	07/08/2018
8720	R&S ESH3-Z5	LISN	28/11/2016	28/11/2018	28/01/2019
8732	Emitech	OATS	11/10/2016	11/10/2019	11/12/2019
8750	La Crosse Technology WS-9232	Meteo station	23/09/2016	23/09/2018	23/11/2018
8783	EMCO 3147	Log periodic antenna	15/03/2016	15/03/2019	15/05/2019
8896	ACQUISYS GPS8	Satellite synchronized frequency standard	/	/	/
8972	K&L Microwave 500-1000MHz	Notch filter	/	/	/
9403	R&S ESU8	Spectrum Analyzer	11/08/2016	11/08/2018	11/10/2018
9489	Absorber sheath current	Emitech	21/04/2016	21/04/2018	21/06/2018
10739	LUCIX Corp S005180M3201	Low-noise amplifier	29/03/2017	29/03/2018	29/05/2018
10788	Emitech	Outside room	/	/	/
11592	R&S NRV-Z86	Power Sensor	02/03/2017	02/03/2018	02/05/2018
14476	Fluke 177	Multimeter	20/03/2017	20/03/2018	20/05/2018
/	GPIBShot V2.4	Software	/	/	/

6. TESTS AND CONCLUSIONS

Subpart C

Test procedure	Description of test	Respected criteria?				Comment
		Yes	No	NAp	NAs	
FCC Part 15.203	ANTENNA REQUIREMENT	X				*Note 1*
FCC Part 15.205	RESTRICTED BANDS OF OPERATION	X				
FCC Part 15.207	CONDUCTED LIMITS	X				
FCC Part 15.209	RADIATED EMISSION LIMITS; general requirements	X				*Note 2*
FCC Part 15.212	MODULAR TRANSMITTERS	X				*Note 3*
FCC part 15.215	ADDITIONAL PROVISIONS TO THE GENERAL RADIATED EMISSION LIMITATIONS					
	(a) Alternative to general radiated emission limits	X				
	(b) Unwanted emissions outside of §15.247 frequency bands	X				*Note 4*
	(c) 20 dB bandwidth and band-edge compliance	X				
FCC Part 15.247	OPERATION WITHIN THE BANDS 902-928 MHZ, 2400-2483.5 MHz and 5725-5850 MHz					
	(a) (1) Hopping systems			X		
	(a) (2) Digital modulation techniques	X				*Note 5*
	(b) Maximum output power	X				
	(c) Operation with directional antenna gains > 6 dBi			X		
	(d) Intentional radiator	X				
	(e) Peak power spectral density	X				
	(f) Hybrid system			X		
	(g) Frequency hopping requirements			X		
	(h) Frequency hopping intelligence			X		
	(i) RF exposure compliance	X				

NAp: Not Applicable NAs: Not Asked

Note 1: dedicated antenna with RP-SMA connector.

Note 2: See FCC part 15.247 (d).

Note 3: Single modular transmitter (Wi-Fi module).
The host devices of the certified modules shall be properly labeled to identify the modules within.

Note 4: See FCC part 15.209. Unwanted emissions levels are all below the fundamental emission field strength level.

Note 5: The minimum 6 dB bandwidth of the equipment is 563 kHz (see appendix 4).

RF EXPOSURE:

MPE

Maximum measured conducted power =27.15 dBm
EIRP with 3 dBi antenna gain = 30.15 dBm = 1035.1 mW

In accordance with KDB 447498 D01 General RF Exposure Guidance v06:

PSD= EIRP/(4*π*R²)

⇨ ***1035.1/(4*π*(20 cm)²)= 0.206 mW/cm² (limit= 0.617 mW/cm²)***

The equipment fulfils the requirements on power density for general population/uncontrolled exposure and therefore fulfils the requirements of 47 CFR §1.1310.

7. MEASUREMENT UNCERTAINTY

To declare, or not, the compliance with the specifications, it was not explicitly taken into account of uncertainty associated with the results.

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for normal distribution corresponds to a coverage probability of approximately 95%.

Parameter	Emitech Uncertainty
RF power, conducted	± 0.75dB
Radiated emission valid to 26 GHz F < 62.5 MHz: 62.5 MHz < F < 1 GHz: 1 GHz < F < 26 GHz:	 ± 5.14 dB ± 5.13 dB ± 5.16 dB
AC Power Lines conducted emissions	± 3.38 dB
Temperature	± 1 °C
Humidity	± 5 %

8. CONDUCTED LIMITS

Temperature (°C) : 24 **Humidity (%HR):** 50 **Date :** September 11, 2017

Technician : T. LEDRESSEUR

Standard: FCC Part 15

Test procedure: Paragraph 15.207

Software used: BAT-EMC V3.6.0.32

Test set up:

The EUT is isolated and placed on a wooden table, 0.8 m over a horizontal reference plane and 0.4 m from a vertical reference plane. It is powered by an artificial main network placed on the ground reference plane.
The equipment is powered with the AC power operating voltage of 120 V / 60 Hz.

See photos in appendix 2

Frequency range: 150 kHz - 30 MHz

Detection mode: Peak / Quasi-peak / Average

Bandwidth: 10 kHz / 9 kHz

Equipment under test operating condition:

The equipment under test is blocked in continuous modulated transmission mode, at the highest output power level at which the transmitter is intended to operate. The measure is repeated for maximal and minimal SF used on central channel.
During this measure the WiFi module is also blocked in emission at central channel

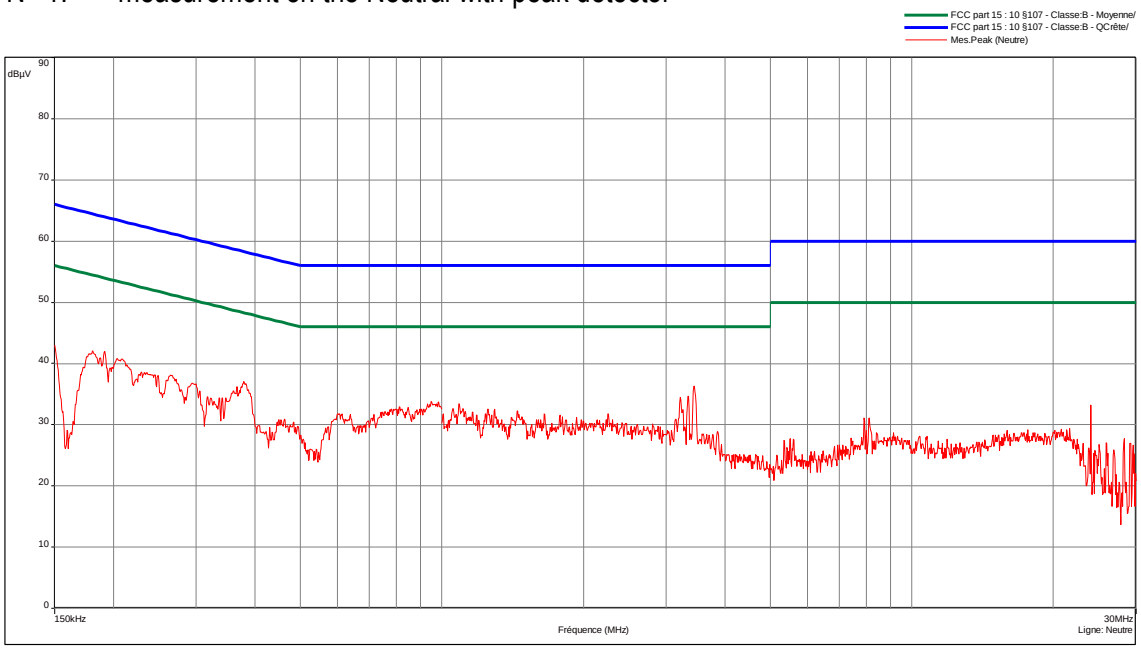
Results:

Sample N° 1: SF 7 at 925.1 MHz

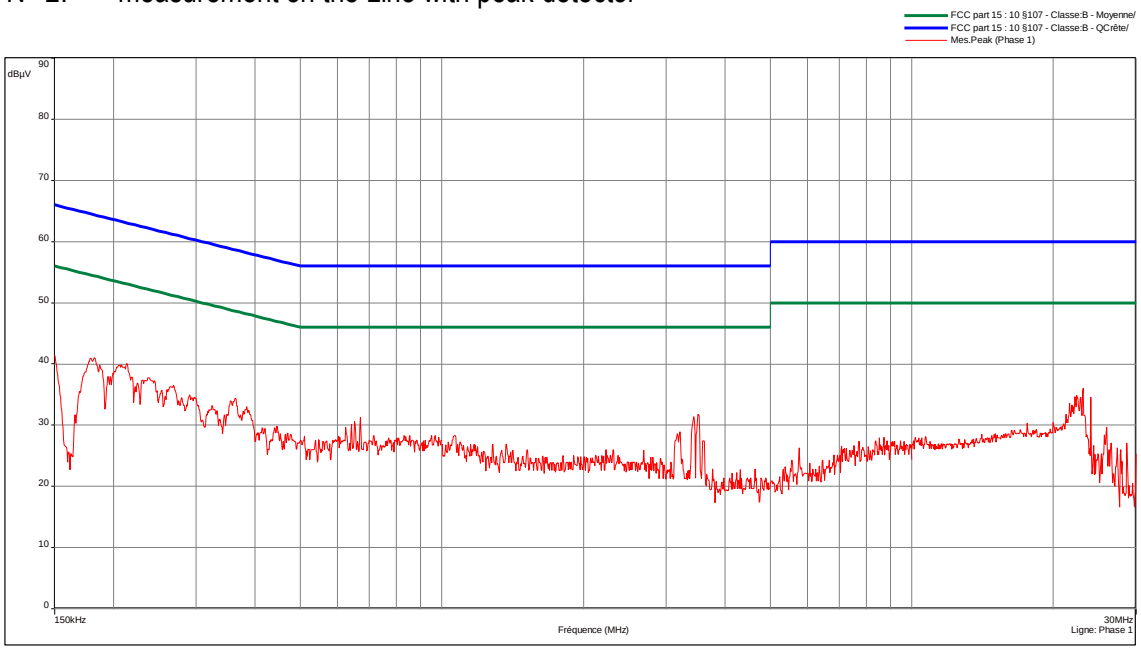
Measurement on the mains power supply:

The measurement is first realized with Peak detector.

Curve N° 1: measurement on the Neutral with peak detector



Curve N° 2: measurement on the Line with peak detector



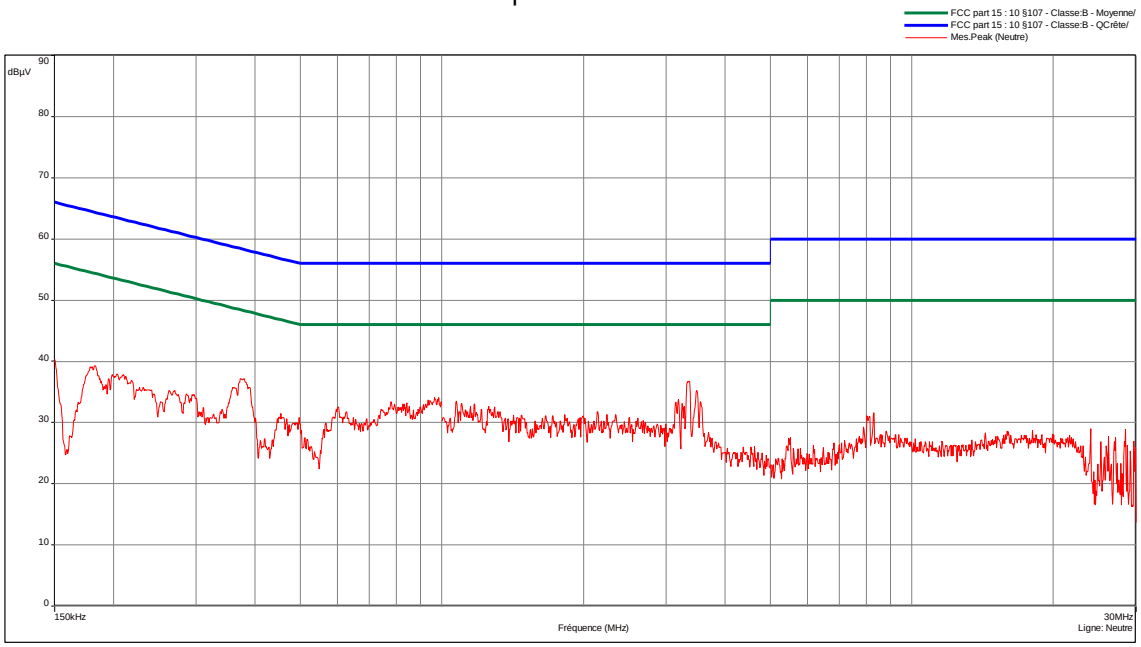
Only the frequencies which are not 6 dB under the Quasi-peak limit are then analyzed with Quasi-peak detector.
Only the frequencies which are not 6 dB under the Average limit are then analyzed with Average detector.

Sample N° 1: SF 12 at 925.1 MHz

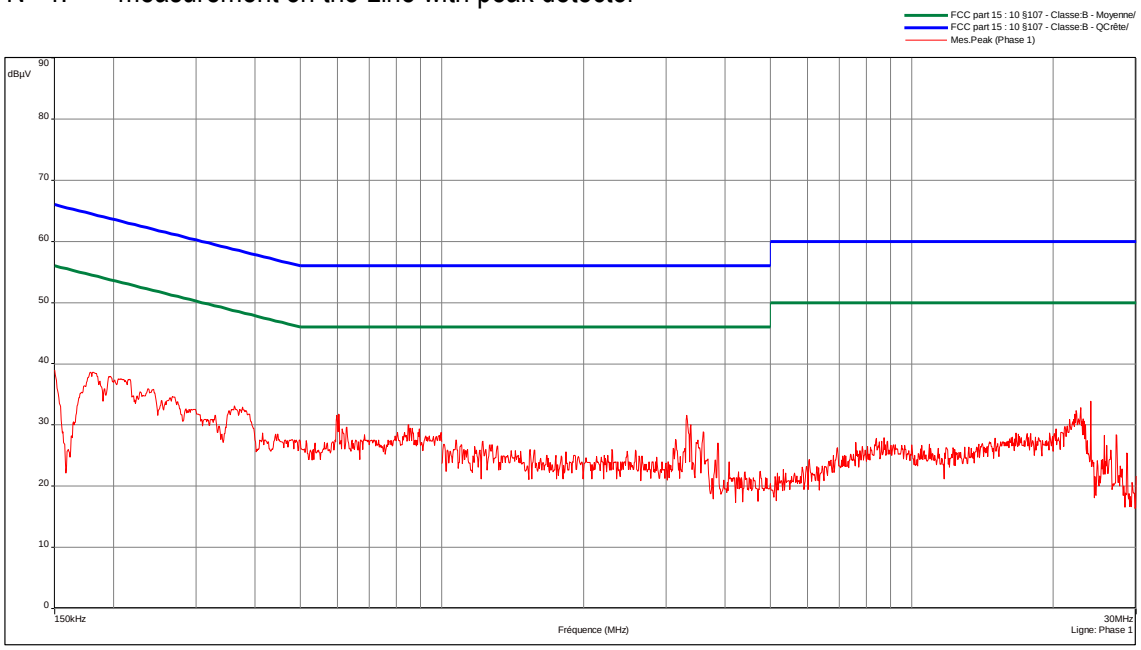
Measurement on the mains power supply:

The measurement is first realized with Peak detector.

Curve N° 3: measurement on the Neutral with peak detector



Curve N° 4: measurement on the Line with peak detector



Only the frequencies which are not 6 dB under the Quasi-peak limit are then analyzed with Quasi-peak detector.
Only the frequencies which are not 6 dB under the Average limit are then analyzed with Average detector.

Test conclusion:

RESPECTED STANDARD

9. ADDITIONAL PROVISIONS TO THE GENERAL RADIATED EMISSION LIMITATIONS

Temperature (°C) : 25 **Humidity (%HR):** 60 **Date :** September 7, 2017

Technician : T. LEDRESSEUR

Standard: FCC Part 15

Test procedure: Paragraph 15.215

Test set up:

Test realized in near field. All field strength measurements are correlated with the radiated maximum peak output power

Test operating condition of the equipment:

The equipment under test is blocked in continuous transmission mode, modulated by internal data signal, at the highest output power level which the transmitter is intended to operate in SF7 and SF 12.

Results:

Power source: 120 Vac – 60 Hz through a variac

Lower Band Edge: 900 MHz to 902 MHz
Upper Band Edge: 928 MHz to 930 MHz

Sample N° 1:

Spread Factor 7

Fundamental frequency (MHz)	Detector (Peak or Average)	Frequency of maximum Band-edges Emission (MHz)	Delta Marker (dB) (2)	Limit (dBµV/m)	Margin (dB)
923.3	P	902	-66.65	-30dBc	36.65
927.5	P	928	-36.16	-30dBc	6.16

(2) Marker-Delta method

Band-edge curves are given in appendix 7

Spread Factor 12

Fundamental frequency (MHz)	Detector (Peak or Average)	Frequency of maximum Band-edges Emission (MHz)	Delta Marker (dB) (2)	Limit (dBµV/m)	Margin (dB)
923.3	P	902	- 67.6	-30dBc	37.6
927.5	P	928	-.36.96	-30dBc	6.96

(2) Marker-Delta method

Band-edge curves are given in appendix 7

Test conclusion:

RESPECTED STANDARD

10. MAXIMUM CONDUCTED (AVERAGE) OUTPUT POWER

Temperature (°C) : 25 **Humidity (%HR):** 60 **Date :** September 7, 2017
Technician : T. LEDRESSEUR

Standard: FCC Part 15

Test procedure: paragraph 15.247 (b)
AVGPM method (using an RF average-reading power meter) of paragraph 9.2.3.1 of KDB 558074

Test set up:

The measure is realized in conducted mode with a calibrated average reading power meter.

Equipment under test operating condition:

The equipment under test is blocked in continuous transmission mode (duty cycle 100%), modulated by internal data signal, at the highest output power level which the transmitter is intended to operate and the measure is repeated with the Spread factor 7 and 12.
Maximum antenna gain used with the product is 3 dBi.

Results:

Power source: 120 Vac – 60 Hz

Sample N° 1 Spread factor 7

Low channel

	Conducted power * (dBm)	Conducted power * (W)	Limit (W)
Nominal supply voltage:	27	0.501	1

Central channel

	Conducted power * (dBm)	Conducted power * (W)	Limit (W)
Nominal supply voltage:	27	0.501	1

High channel

	Conducted power * (dBm)	Conducted power * (W)	Limit (W)
Nominal supply voltage:	26.6	0.457	1

Sample N° 1 Spread factor 12

Low channel

	Conducted power (dBm)	Conducted power (W)	Limit (W)
Nominal supply voltage:	27.12	0.515	1

Central channel

	Conducted power (dBm)	Conducted power (W)	Limit (W)
Nominal supply voltage:	27.15	0.518	1

High channel

	Conducted power (dBm)	Conducted power (W)	Limit (W)
Nominal supply voltage:	26.7	0.467	1

Test conclusion:

RESPECTED STANDARD

11. INTENTIONAL RADIATOR

Temperature (°C) : 24.3 **Humidity (%HR):** 53 **Date :** September 8, 2017
Technician : T. LEDRESSEUR

Standard: FCC Part 15

Test procedure: paragraph 15.205, paragraph 15.209, paragraph 15.247 (d)
Emissions in non-restricted frequency bands method of paragraph 11 of KDB 558074
Emissions in restricted frequency bands method of paragraph 12 of KDB 558074

Test set up:

First an exploratory radiated measurement was performed. During this phase the product is oriented in three orthogonal planes.

Then the final measurement is realized with the product on the most critical orientation.

The measure is realized on open area test site under 1 GHz and in anechoic chamber above 1 GHz.

When the system is tested in an open area test site (OATS), the EUT is placed on a rotating table, 0.8m from a ground plane.

When the system is tested in anechoic chamber, the EUT is placed on a rotating table, 1.5m from a ground plane.

Zero degree azimuths correspond to the front of the device under test.

See photos in appendix 2.

Frequency range: From 9 kHz to 10th harmonic of the highest fundamental frequency (9.275 GHz) or 5th harmonic of the highest frequency used by the digital device (133 MHz) whichever is greater

Detection mode: Quasi-peak (F < 1 GHz) Peak / Average (F > 1 GHz)

Bandwidth: 200Hz (9 kHz < F < 150kHz)
9 kHz (150 kHz < F < 30MHz)
120 kHz (30 MHz < F < 1 GHz)
100 kHz / 1 MHz (F > 1 GHz)

Distance of antenna: 10 meters (in open area test site) / 3 meters (in anechoic room)

Antenna height: 1 to 4 meters (in open area test site) / 1.5 meter (in anechoic room)

Antenna polarization: vertical and horizontal (only the highest level is recorded)

Equipment under test operating condition:

The equipment under test is blocked in continuous transmission mode, modulated by internal data signal, at the highest output power level which the transmitter is intended to operate in SF7 and SF 12.

Results:

Power source: 120 Vac – 60 Hz

Sample N° 1 Spread factor 7

Low channel

Frequencies (MHz)	Detector P QP Av	RBW (kHz)	Field strength Measured at 3m (dBµV/m)	Limits (dBµV/m)	Margin (dB)
1846.5	P	100	35.97	96.7	60.73
2770 (3)	P	1000	42.29 (4)	74	31.71
3693.2 (3)	P	1000	39.3 (4) (5)	74	34.7
4616.5 (3)	P	1000	39.68 (4) (5)	74	34.32
5539.8	P	100	40.7 (5)	96.7	56
6464.4	P	100	50.33	96.7	46.37

P= Peak, QP=Quasi-peak, Av=Average
(3) restricted bands of operation in 15.205
(4) the peak level is lower than the average limit (54 dBµV/m).
(5) Noise floor

Central channel

Frequencies (MHz)	Detector P QP Av	RBW (kHz)	Field strength Measured at 3m (dBµV/m)	Limits (dBµV/m)	Margin (dB)
1850	P	100	37.36	96.7	59.34
2775 (3)	P	1000	45.68 (4)	74	28.32
3700.4 (3)	P	1000	38 (4) (5)	74	36
4625.5 (3)	P	1000	40.01 (4) (5)	74	33.99
5550.6	P	100	40.73 (5)	96.7	55.97
6474.4	P	100	48.98	96.7	47.72

P= Peak, QP=Quasi-peak, Av=Average
(3) restricted bands of operation in 15.205
(4) the peak level is lower than the average limit (54 dBµV/m).
(5) Noise floor

High channel

Frequencies (MHz)	Detector P QP Av	RBW (kHz)	Field strength Measured at 3m (dBµV/m)	Limits (dBµV/m)	Margin (dB)
1854.5	P	100	35.32	96.7	61.38
2783 (3)	P	1000	44.38 (4)	74	29.62
3710 (3)	P	1000	39.36 (4) (5)	74	34.64
4637.5 (3)	P	1000	39.64 (4) (5)	74	34.36
5565	P	100	41.83 (5)	96.7	54.87
6491.6	P	100	49.4	96.7	47.3

P= Peak, QP=Quasi-peak, Av=Average
(3) restricted bands of operation in 15.205
(4) the peak level is lower than the average limit (54 dBµV/m).
(5) Noise floor

Applicable limits: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 30 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

The highest level recorded in a 100 kHz bandwidth is 126.7 dBµV/m on low channel .
So the applicable limit is 96.7 dBµV/m.
In addition, radiated emissions which fall in the restricted band, as defined in section 15.205 (a), must also comply with the radiated emission limits specified in section 15.209 (a) (see section 15.205 (c)).

Note: any spurious which has more than 20 dB of margin compared to the applicable limit is not necessarily reported.

Sample N° 1 Spread factor 12

Low channel

Frequencies (MHz)	Detector P QP Av	RBW (kHz)	Field strength Measured at 3m (dBµV/m)	Limits (dBµV/m)	Margin (dB)
1846.5	P	100	35.43	96.3	60.87
2770 (3)	P	1000	43.98 (4)	74	30.02
3693.2 (3)	P	1000	39.04 (4) (5)	74	34.96
4616.5(3)	P	1000	40.18 (4) (5)	74	33.82
5539.8	P	100	41.28 (5)	96.3	55.02
6464.4	P	100	49.71	96.3	46.59

P= Peak, QP=Quasi-peak, Av=Average
(3) restricted bands of operation in 15.205
(4) the peak level is lower than the average limit (54 dBµV/m).
(5) Noise floor

Central channel

Frequencies (MHz)	Detector P QP Av	RBW (kHz)	Field strength Measured at 3m (dBµV/m)	Limits (dBµV/m)	Margin (dB)
1850	P	100	36.67	96.3	59.63
2775 (3)	P	1000	44.6 (4)	74	29.4
3700.4 (3)	P	1000	38.32 (4) (5)	74	35.68
4625.5 (3)	P	1000	40.14 (4) (5)	74	33.86
5550.6	P	100	42.03 (5)	96.3	54.27
6474.4	P	100	49.37	96.3	46.93

P= Peak, QP=Quasi-peak, Av=Average
(3) restricted bands of operation in 15.205
(4) the peak level is lower than the average limit (54 dBµV/m).
(5) Noise floor

High channel

Frequencies (MHz)	Detector P QP Av	RBW (kHz)	Field strength Measured at 3m (dBµV/m)	Limits (dBµV/m)	Margin (dB)
1854.5	P	100	35.34	96.3	60.96
2783 (3)	P	1000	46.01 (4)	74	27.99
3710 (3)	P	1000	39.32 (4) (5)	74	34.68
4637.5 (3)	P	1000	39.75 (4) (5)	74	34.25
5565	P	100	40.85 (5)	96.3	55.45
6491.6	P	100	50.06	96.3	46.24

P= Peak, QP=Quasi-peak, Av=Average
(3) restricted bands of operation in 15.205
(4) the peak level is lower than the average limit (54 dBµV/m).
(5) Noise floor

Applicable limits: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 30 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

The highest level recorded in a 100 kHz bandwidth is 126.3 dBµV/m on low channel .
So the applicable limit is 96.3 dBµV/m.
In addition, radiated emissions which fall in the restricted band, as defined in section 15.205 (a), must also comply with the radiated emission limits specified in section 15.209 (a) (see section 15.205 (c)).

Note: any spurious which has more than 20 dB of margin compared to the applicable limit is not necessarily reported.

Test conclusion:

RESPECTED STANDARD

12. PEAK POWER DENSITY

Temperature (°C) : 25 **Humidity (%HR):** 60 **Date :** September 7, 2017
Technician : T. LEDRESSEUR

Standard: FCC Part 15

Test procedure: paragraph 15.247 (e)
AVGPSD-1 of paragraph 10.3 of KDB 558074

Test set up:

The measure is realized in conducted mode and the PSD is measured with a spectrum analyser.

Span: 1000 kHz
Resolution bandwidth: 3 kHz
Video bandwidth: 10 kHz
Detector: RMS
Number of points: 1000 (> 2*span/RBW > 2*1000 /3)
Trace averaging (RMS) mode is used over 100 (SF7) or 1000 traces (SF12).

Then the peak marker function is used.

Equipment under test operating condition:

The equipment under test is blocked in continuous transmission mode (duty cycle 100%), modulated by internal data signal, at the highest output power level which the transmitter is intended to operate and the measure is repeated with the Spread factor 7 and 12.
Maximum antenna gain used with the product is 3 dBi.

Results:

Power source: 120 Vac – 60 Hz

Sample N° 1 Spread factor 7

Low channel

	Conducted PSD (dBm/3kHz)	Limit (dBm/3kHz)
Nominal supply voltage:	6.37	8

Central channel

	Conducted PSD (dBm/3kHz)	Limit (dBm/3kHz)
Nominal supply voltage:	6.35	8

High channel

	Conducted PSD (dBm/3kHz)	Limit (dBm/3kHz)
Nominal supply voltage:	5.94	8

Sample N° 1 Spread factor 12

Low channel

	Conducted PSD (dBm/3kHz)	Limit (dBm/3kHz)
Nominal supply voltage:	7.12	8

Central channel

	Conducted PSD (dBm/3kHz)	Limit (dBm/3kHz)
Nominal supply voltage:	6.36	8

High channel

	Conducted PSD (dBm/3kHz)	Limit (dBm/3kHz)
Nominal supply voltage:	6.36	8

See curves in appendix 8

Test conclusion:

RESPECTED STANDARD

□□□ End of report, 8 appendixes to be forwarded □□□

APPENDIX 1: Photos of the equipment under test

See document Internal Photo and External Photo

APPENDIX 2: Test set up

See document Test setup

APPENDIX 3: Test equipment list

Conducted limits

TYPE	MANUFACTURER	EMITECH NUMBER
Outside room Hors cage	Emitech	10788
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Test receiver ESU8	Rohde & Schwarz	9403
LISN ESH3-Z5	Rohde & Schwarz	8720
High-pass filter EZ-25	Rohde & Schwarz	8635
Absorber sheath current	Emitech	9489
Power source 1251RP	California Instruments	7011
Multimeter 177	Fluke	14476
Meteo station WS-9232	La Crosse Technology	8750
Software	BAT-EMC V3.6.0.32	0000

Additional provisions to the general radiated emission limitations

TYPE	MANUFACTURER	EMITECH NUMBER
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Power source 1251RP	California Instruments	7011
Multimeter 177	Fluke	14476
Meteo station WS-9232	La Crosse Technology	8750

Maximum conducted (average) output power

TYPE	MANUFACTURER	EMITECH NUMBER
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Power source 1251RP	California Instruments	7011
Multimeter 177	Fluke	14476
Meteo station WS-9232	La Crosse Technology	8750
Wideband Power sensor NRP-Z86	Rohde & Schwarz	11592
Power viewer plus	Rohde & Schwarz	/

Intentional radiator

TYPE	MANUFACTURER	EMITECH NUMBER
Anechoic Chamber	EMITECH	8593
Open test site	EMITECH	8732
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Test receiver ESI7	Rohde & Schwarz	8707
Loop antenna 6502	EMCO	1406
Biconical antenna VHBB 9124	Schwarzbeck	8526
Biconical antenna VHA 9103	Schwarzbeck	8528
Log periodic antenna UHALP 9108A	Schwarzbeck	8543
Log periodic antenna 3147	EMCO	8783
Antenna 3115	EMCO	8535
Low-noise amplifier 8447D	Hewlett Packard	8511
Low-noise amplifier S005180M3201	LUCIX Corp.	10739
High pass filter HPM11630	Hewlett Packard	6609
Low pass filter WLJS800-C11/60EE	Wainwright	4393
Notch filter 500-1000MHz	K&L Microwave	8972
Power source 1251RP	California Instruments	7011
Multimeter 177	Fluke	14476
Meteo station WS-9232	La Crosse Technology	8750
Software	BAT-EMC V3.6.0.32	0000

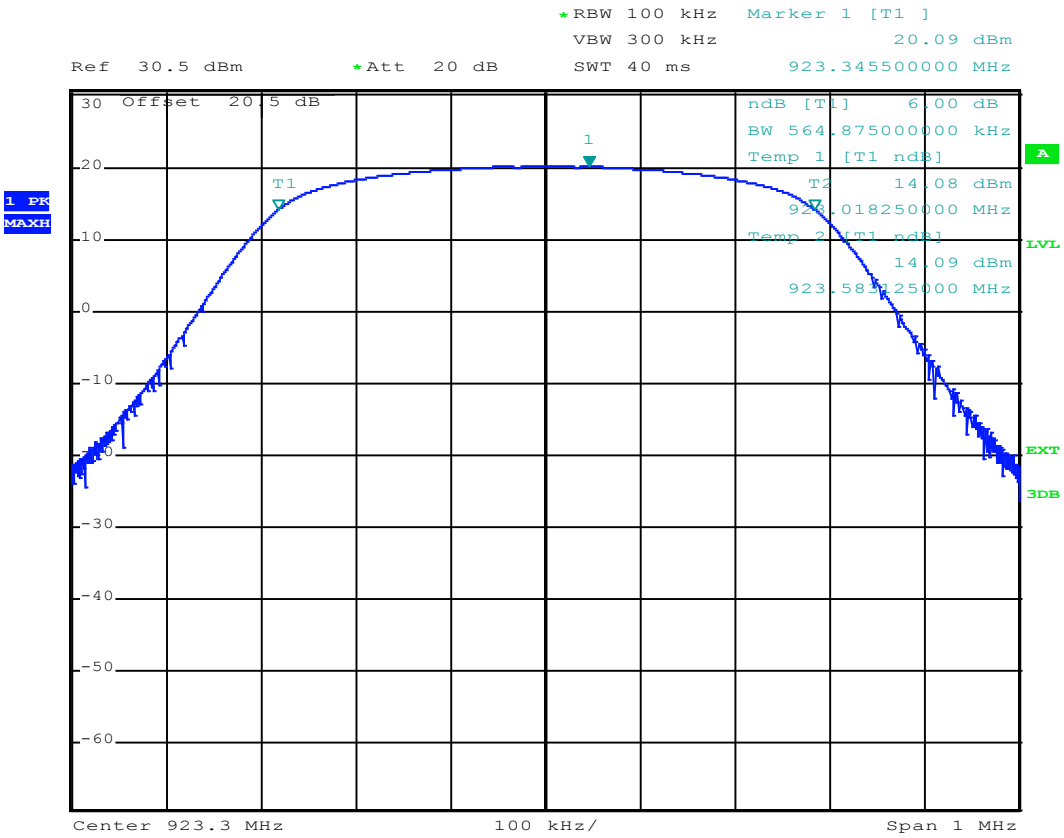
6dB bandwidth / 20 dB bandwidth / 99% bandwidth / Band edge and Peak power density

TYPE	MANUFACTURER	EMITECH NUMBER
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Power source 1251RP	California Instruments	7011
Multimeter 177	Fluke	14476
Meteo station WS-9232	La Crosse Technology	8750

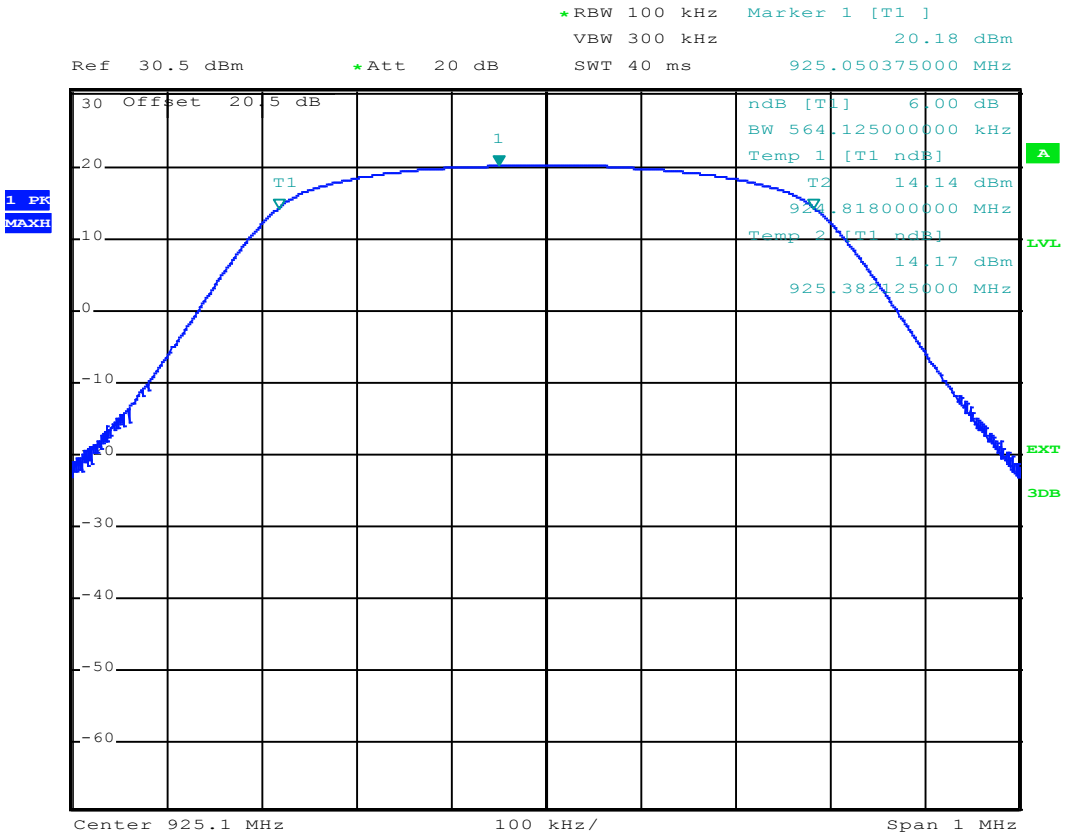
APPENDIX 4: 6 dB bandwidth

Spread Factor 7

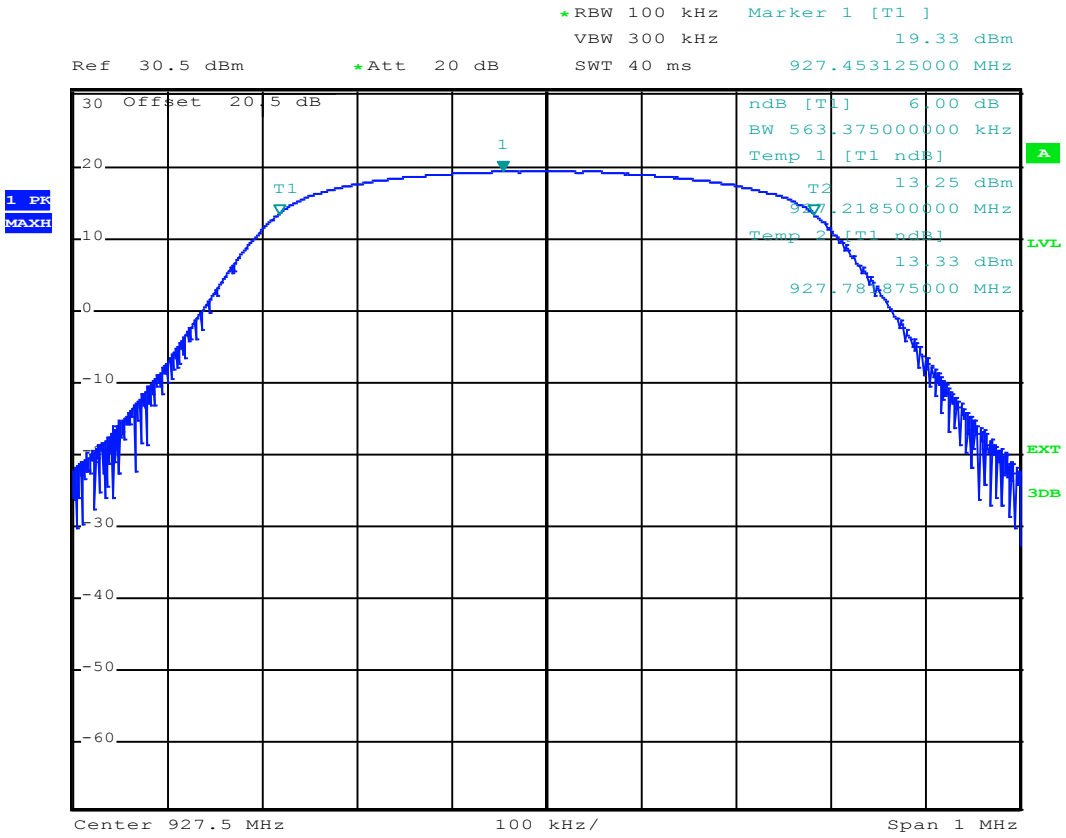
Low channel



Central channel

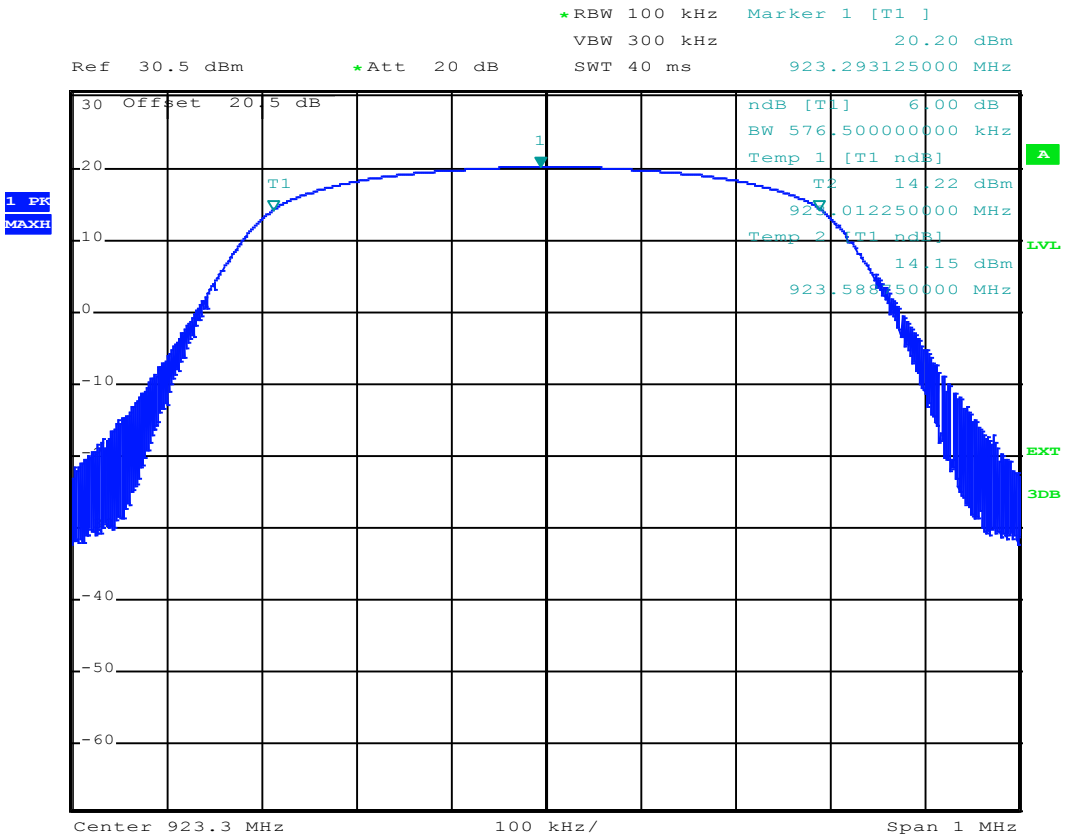


High channel

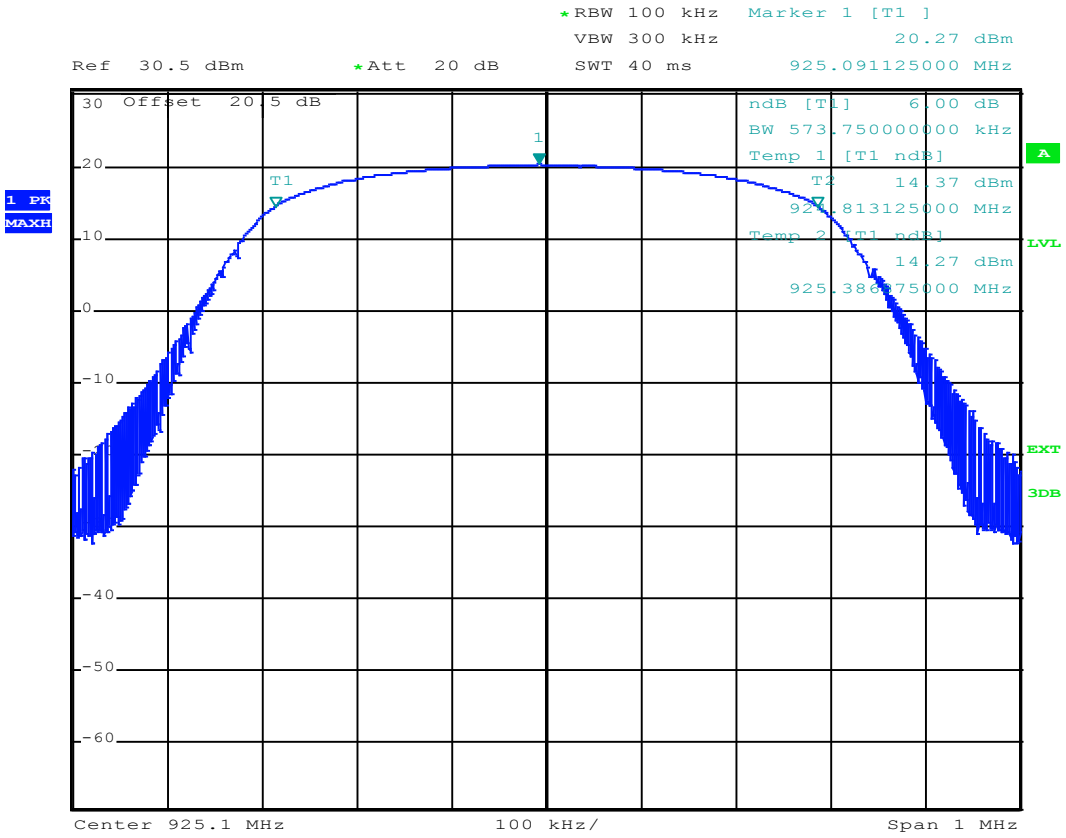


Spread Factor 12

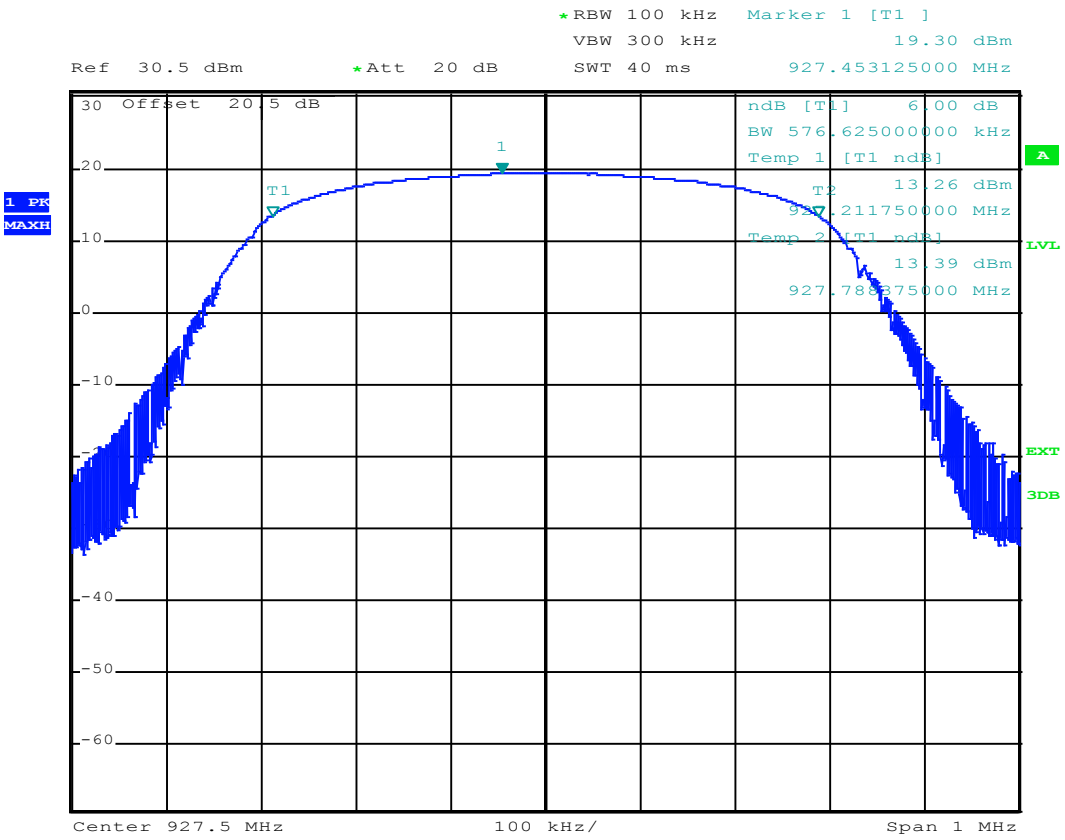
Low channel



Central channel



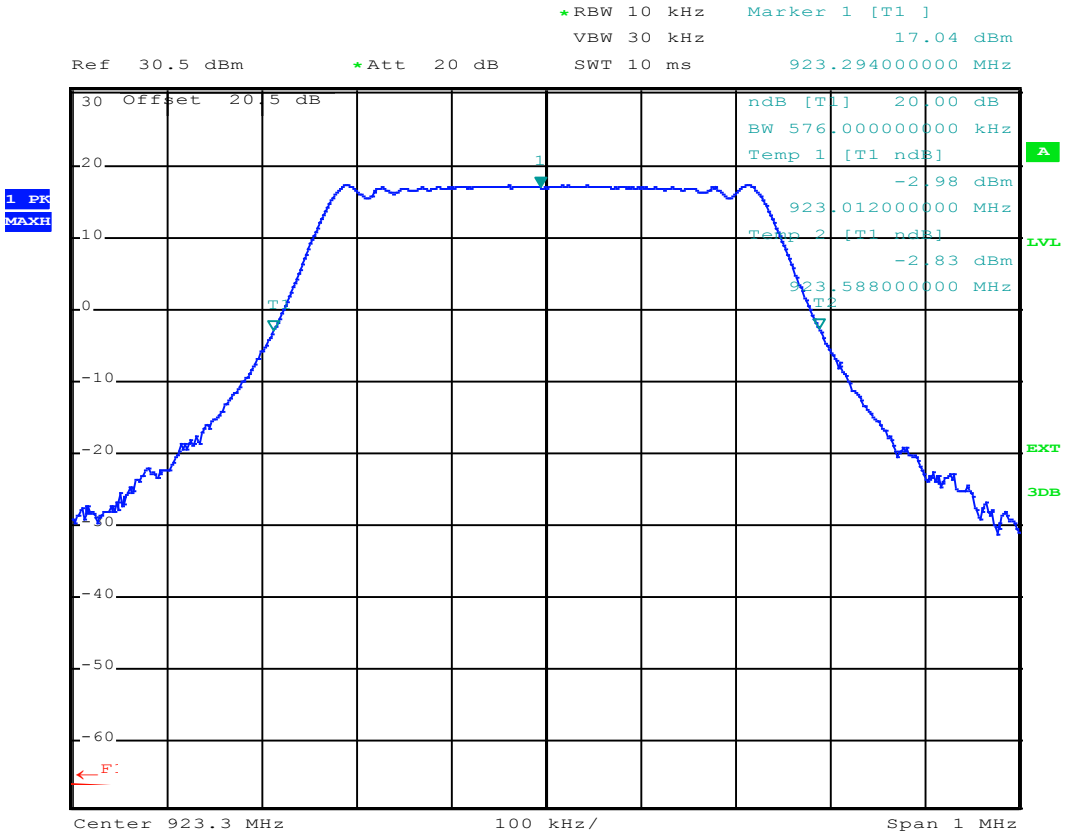
High channel



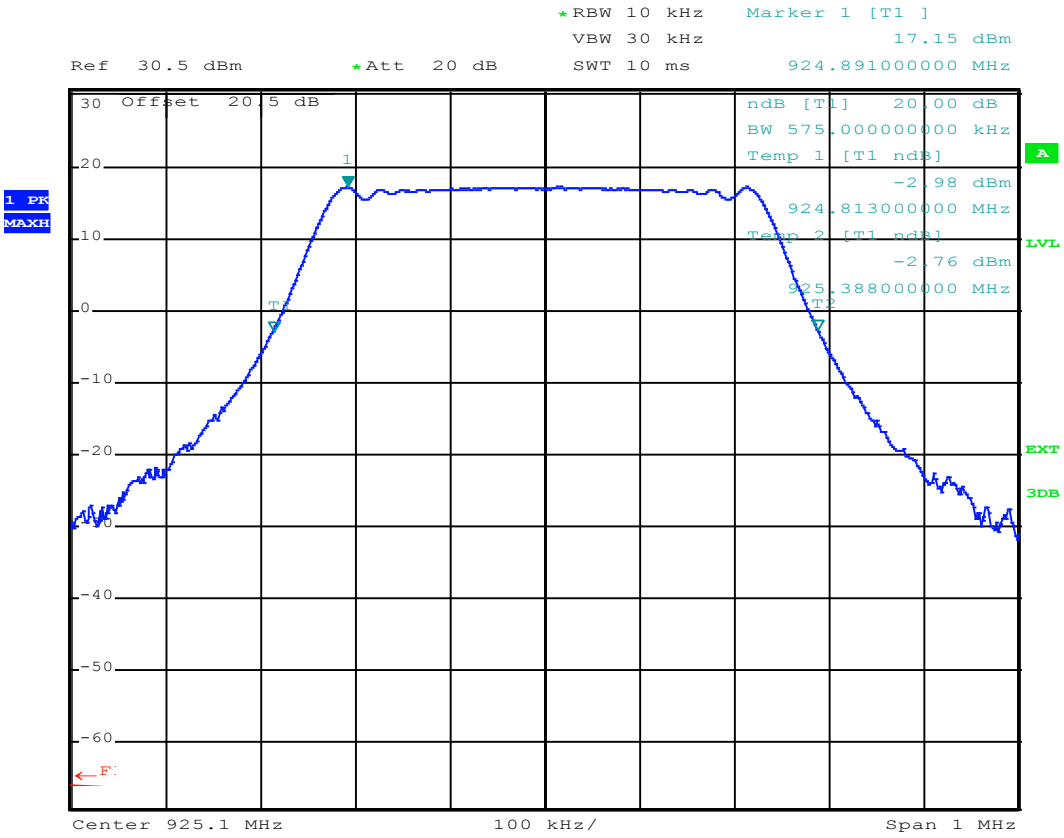
APPENDIX 5: 20 dB bandwidth

Spread Factor 7

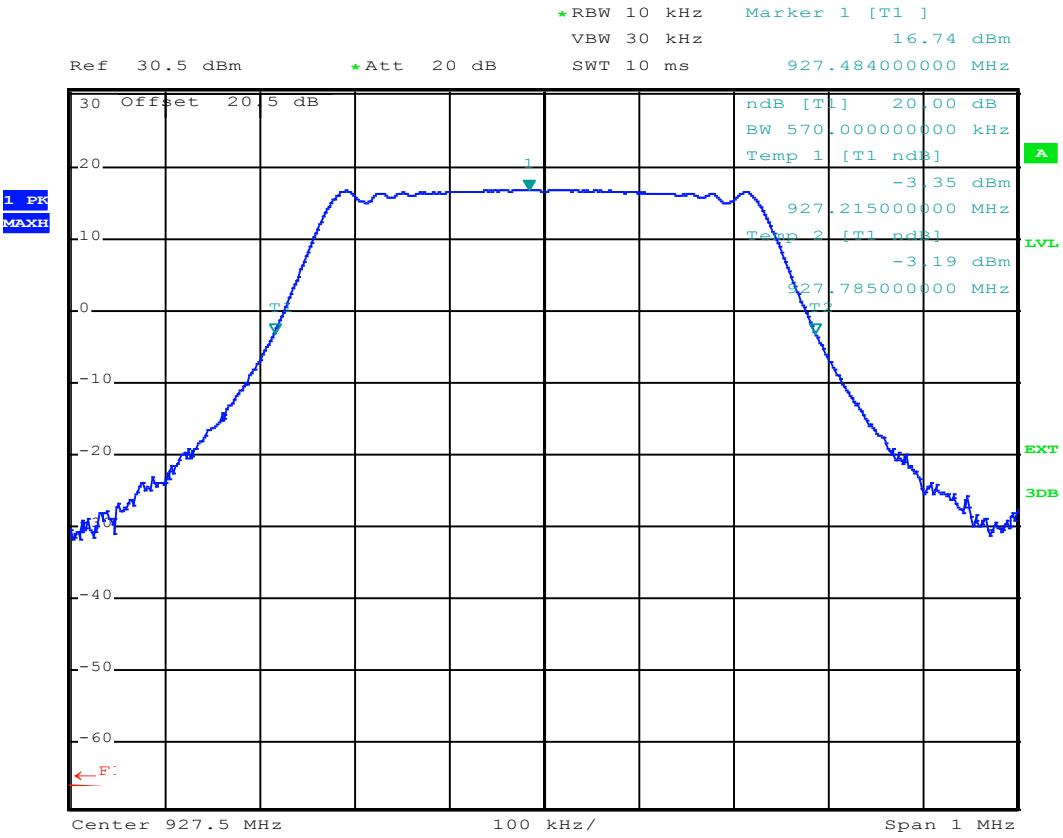
Low channel



Central channel

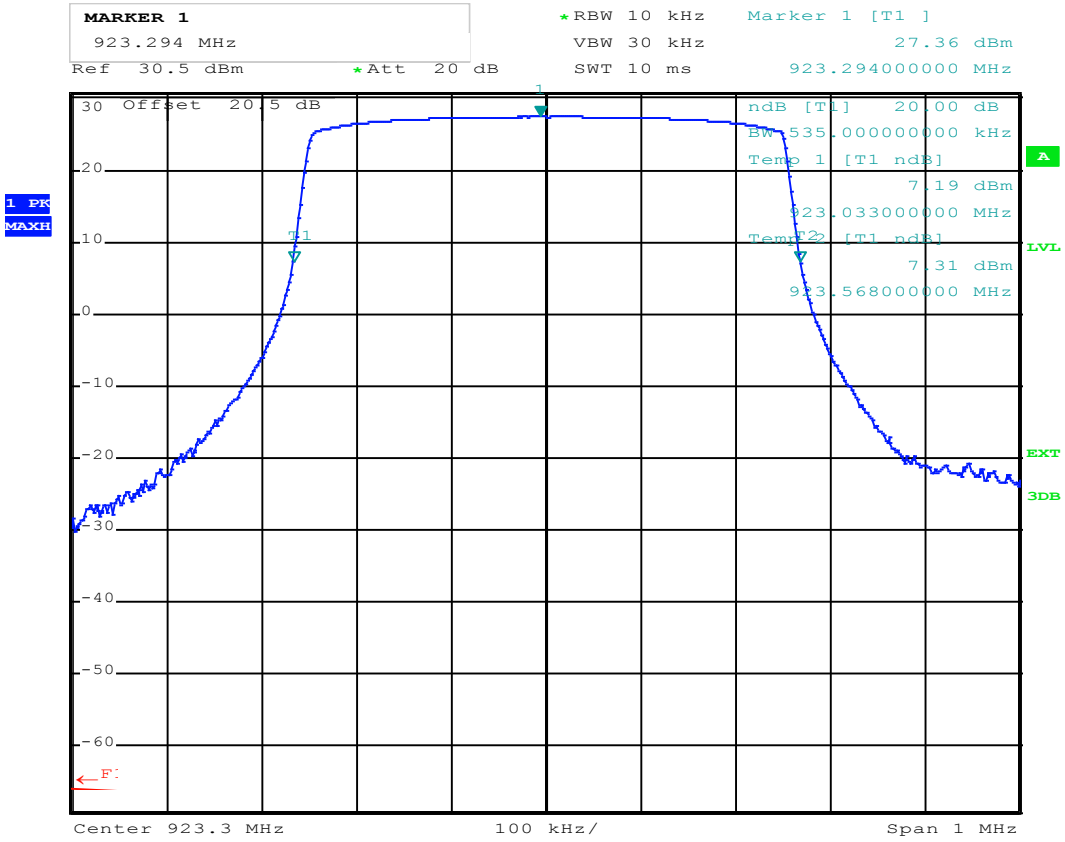


High channel

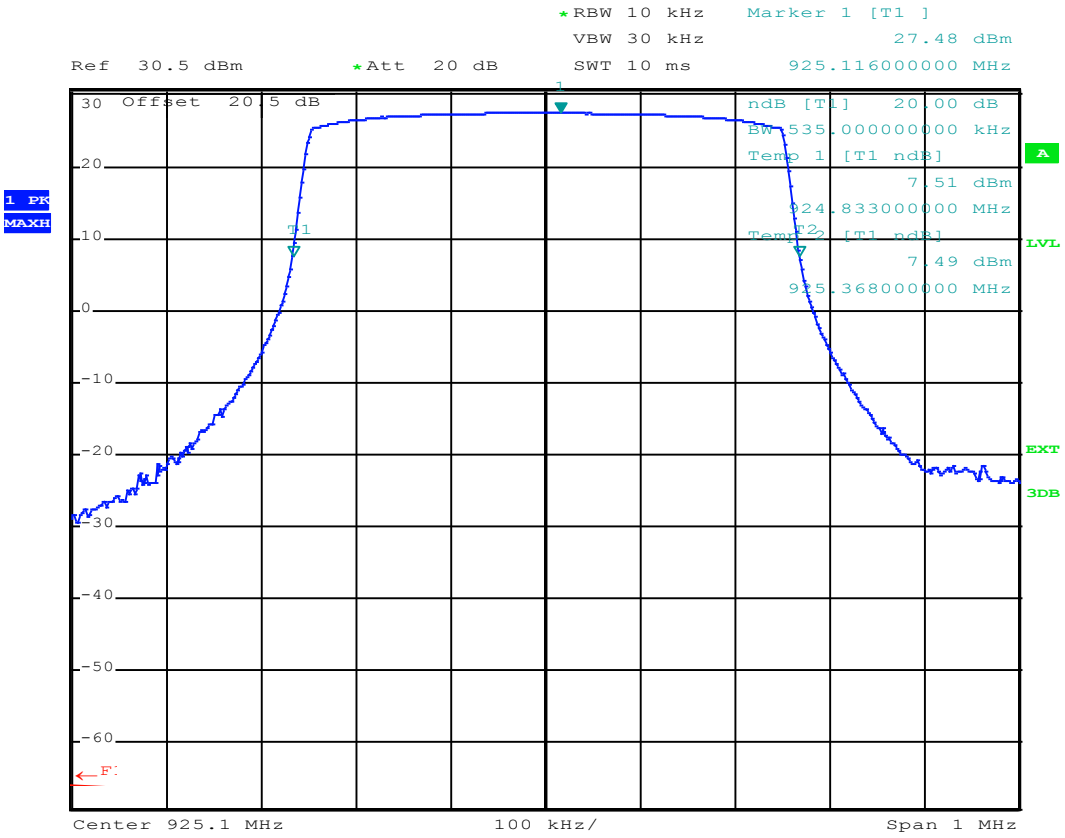


Spread Factor 12

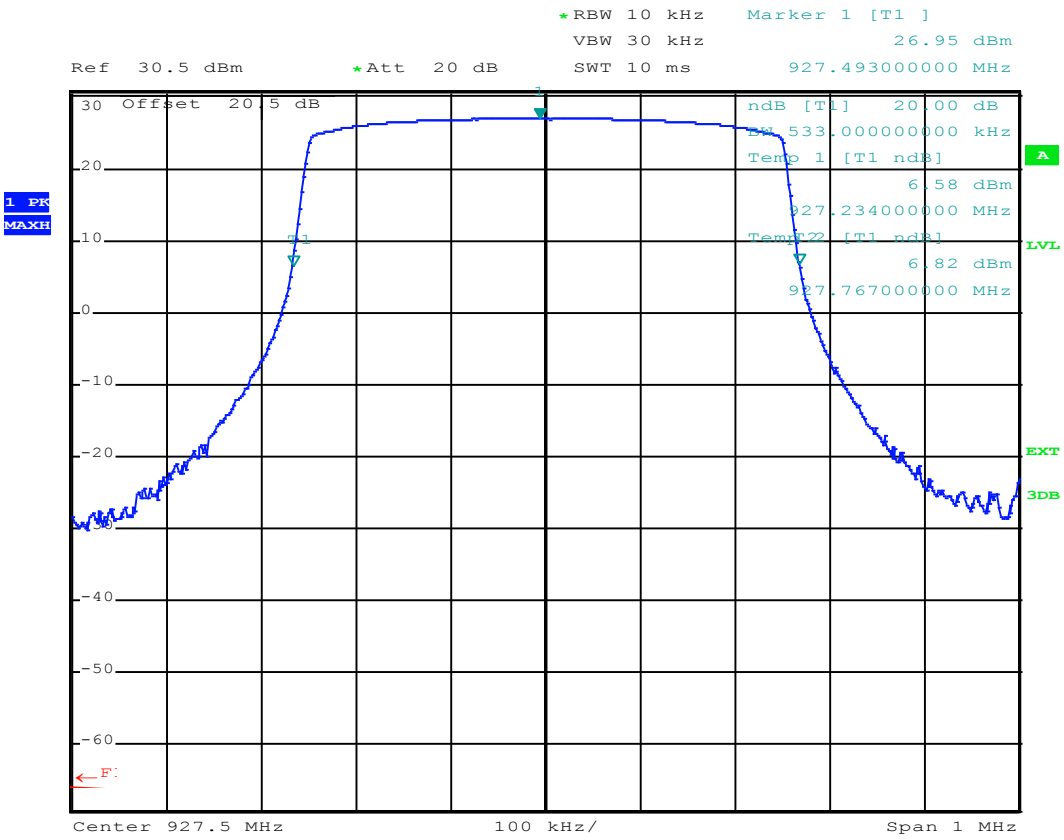
Low channel



Central channel



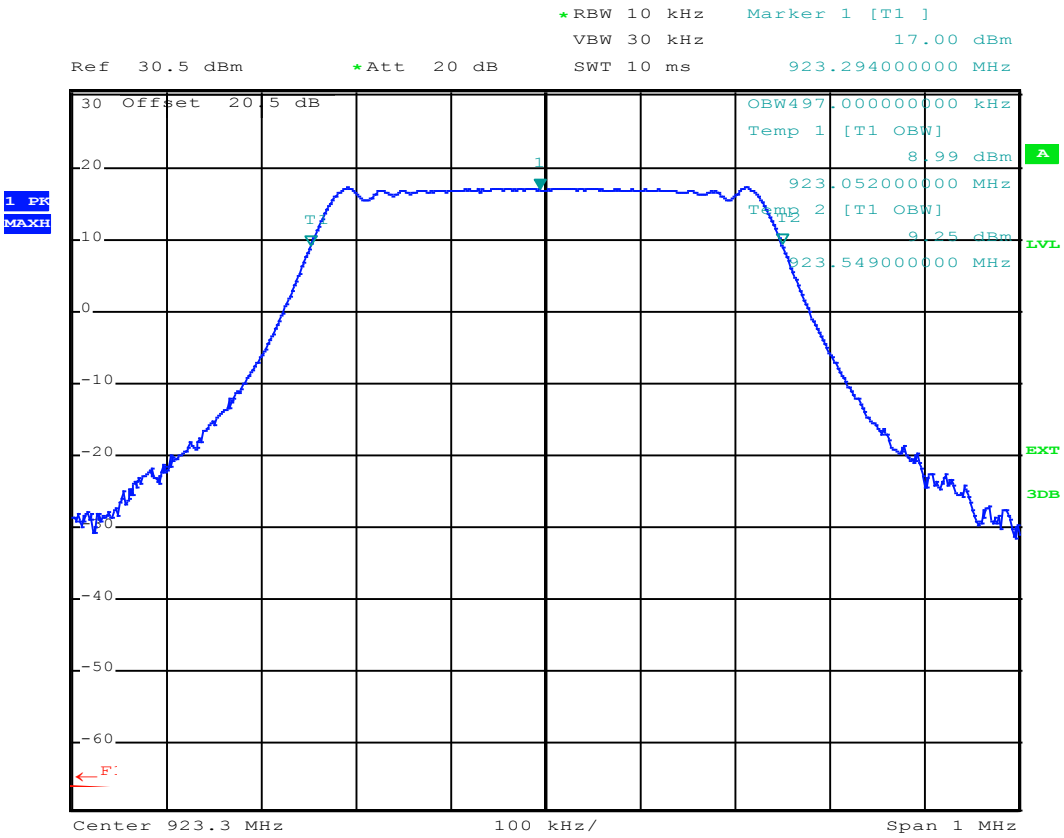
High channel



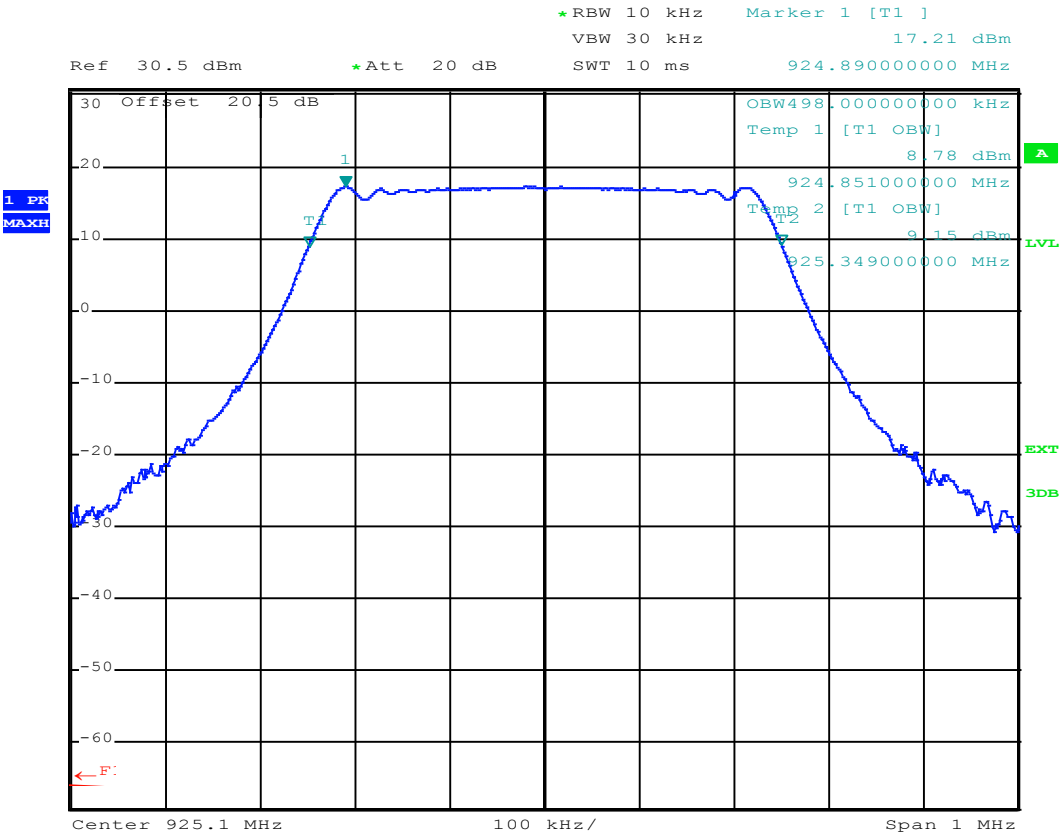
APPENDIX 6: 99% bandwidth

Spread Factor 7

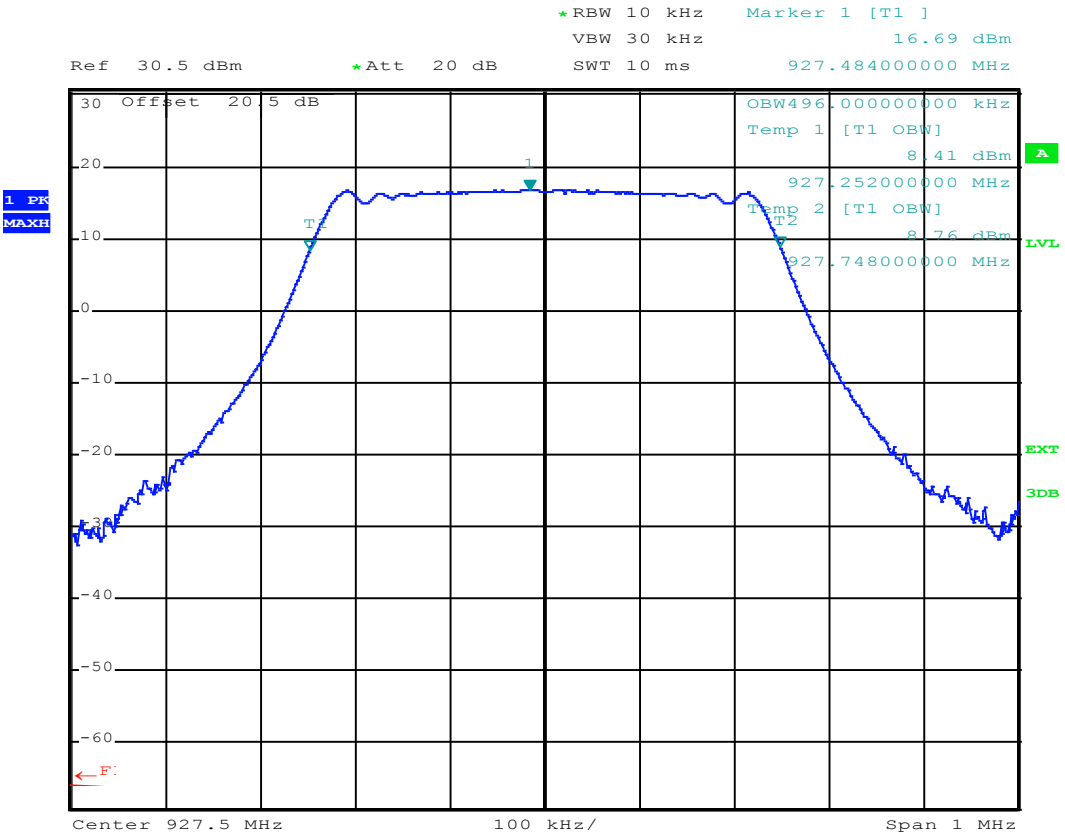
Low channel



Central channel

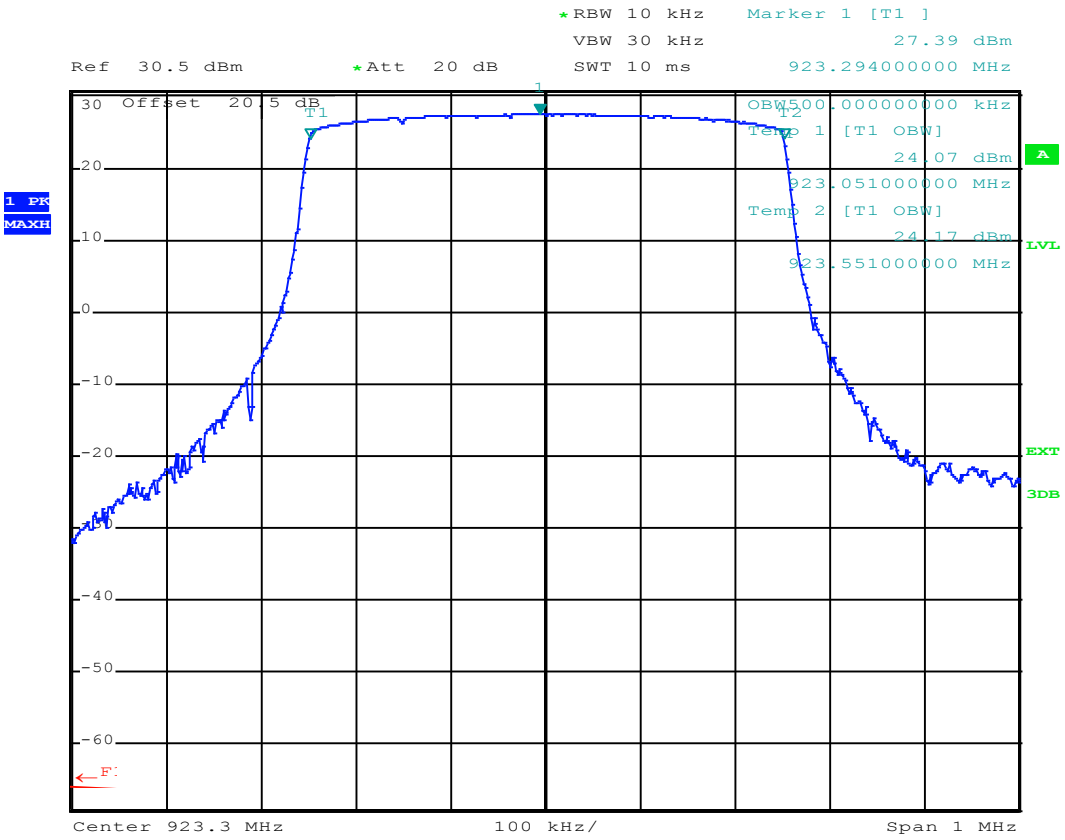


High channel

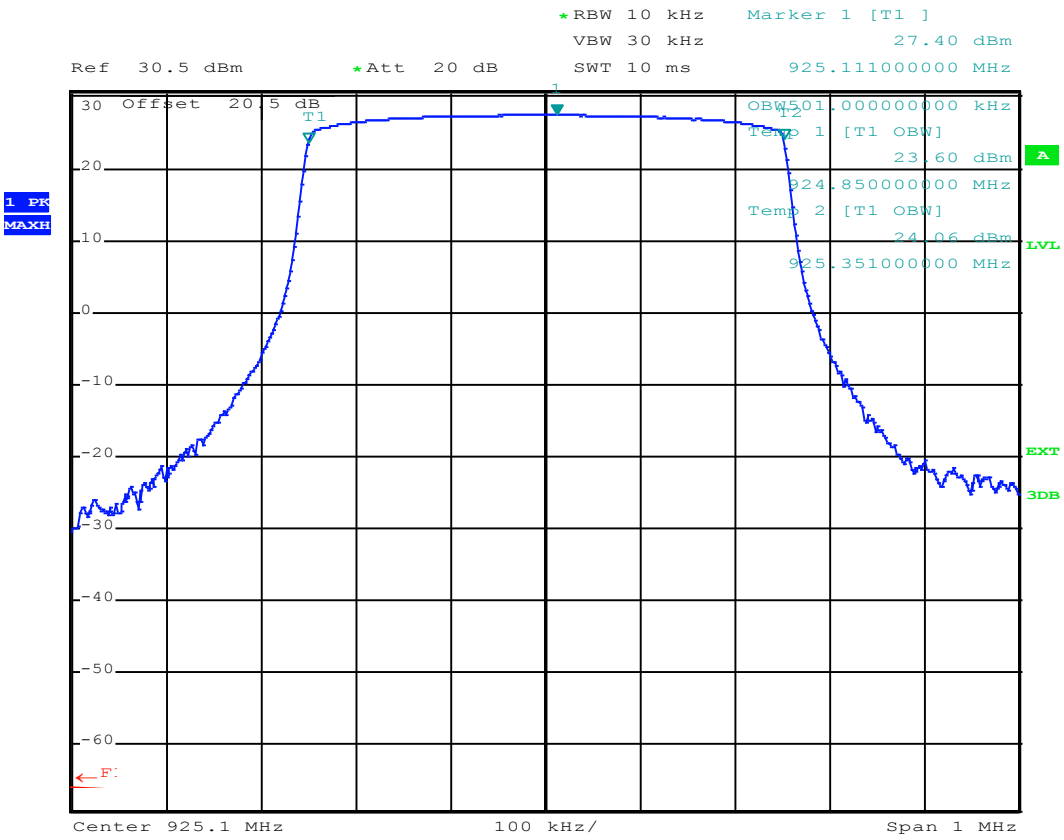


Spread Factor 12

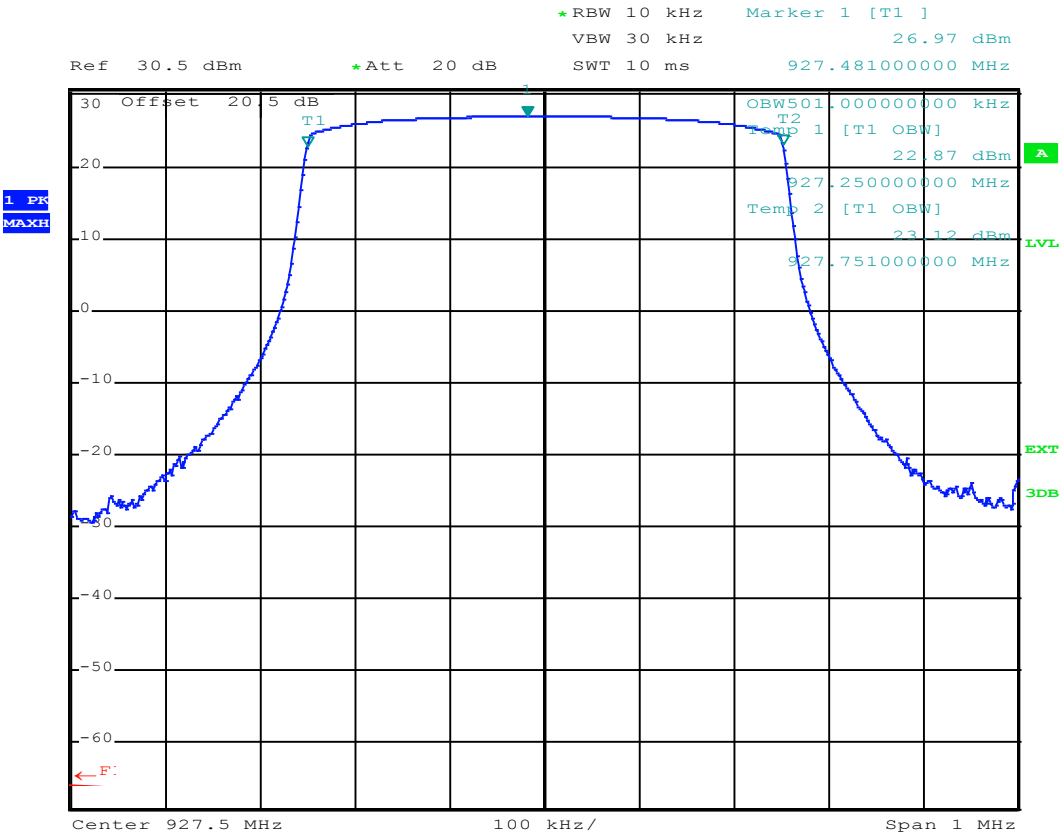
Low channel



Central channel



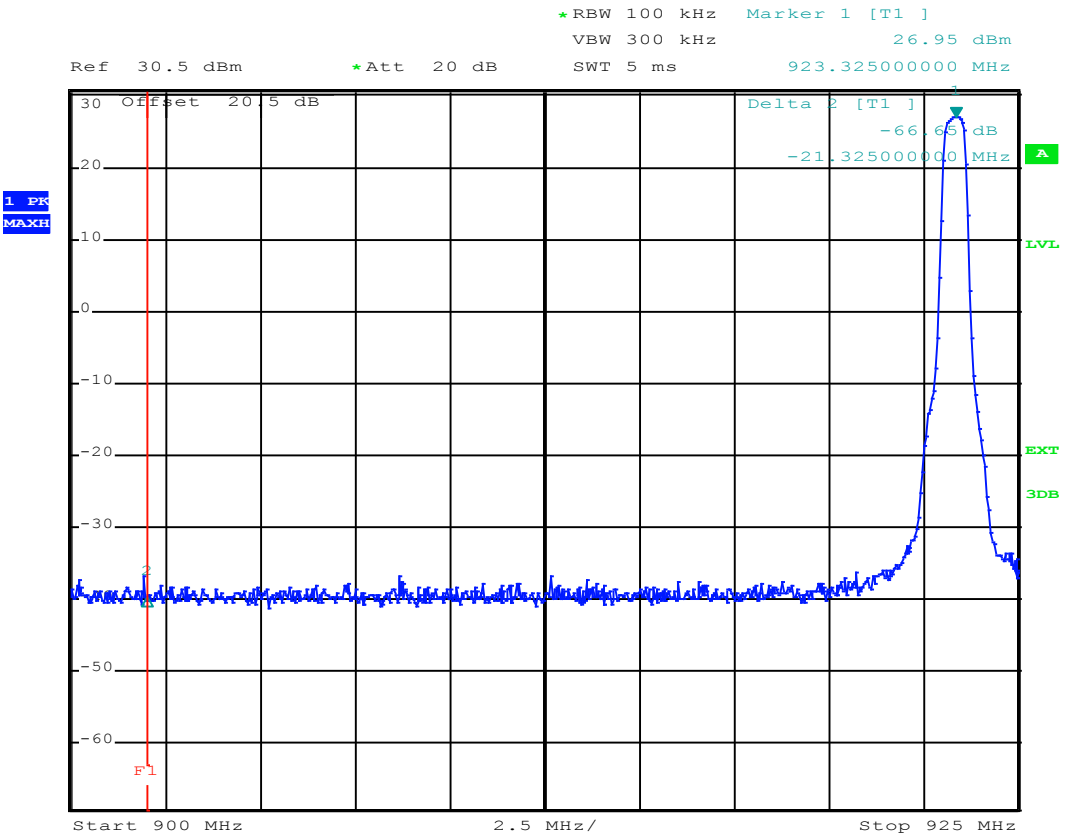
High channel



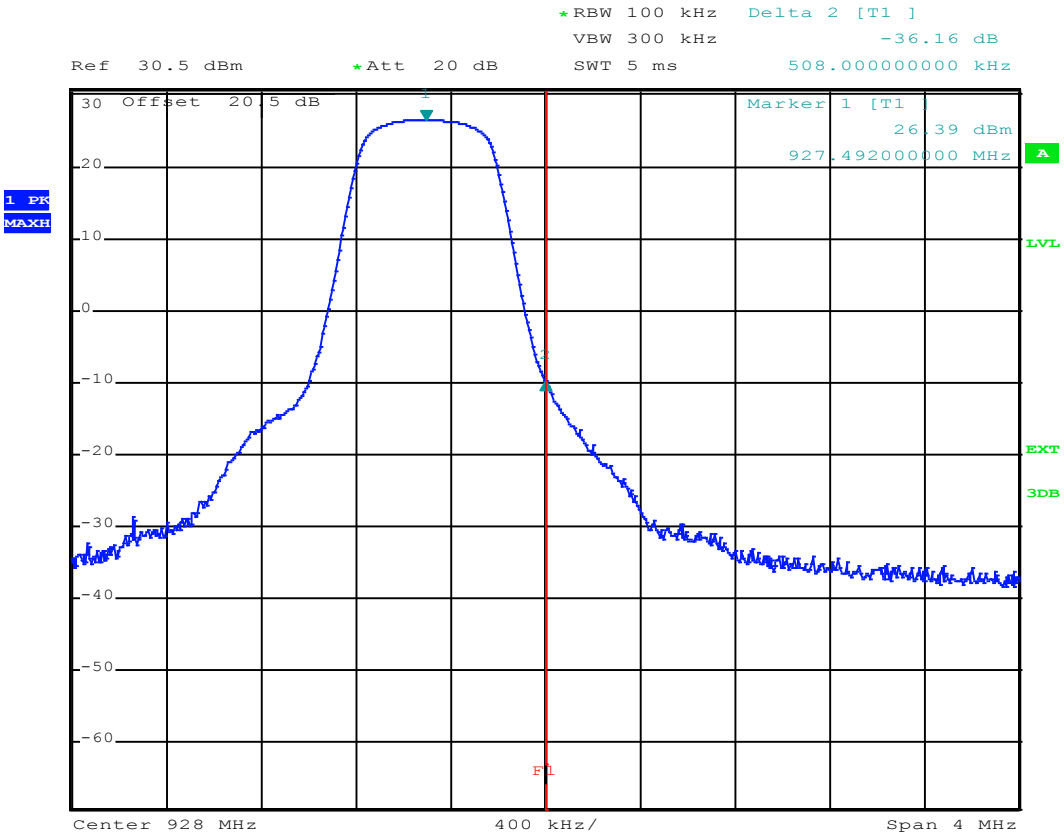
APPENDIX 7: Band edge

Spread Factor 7

Low channel

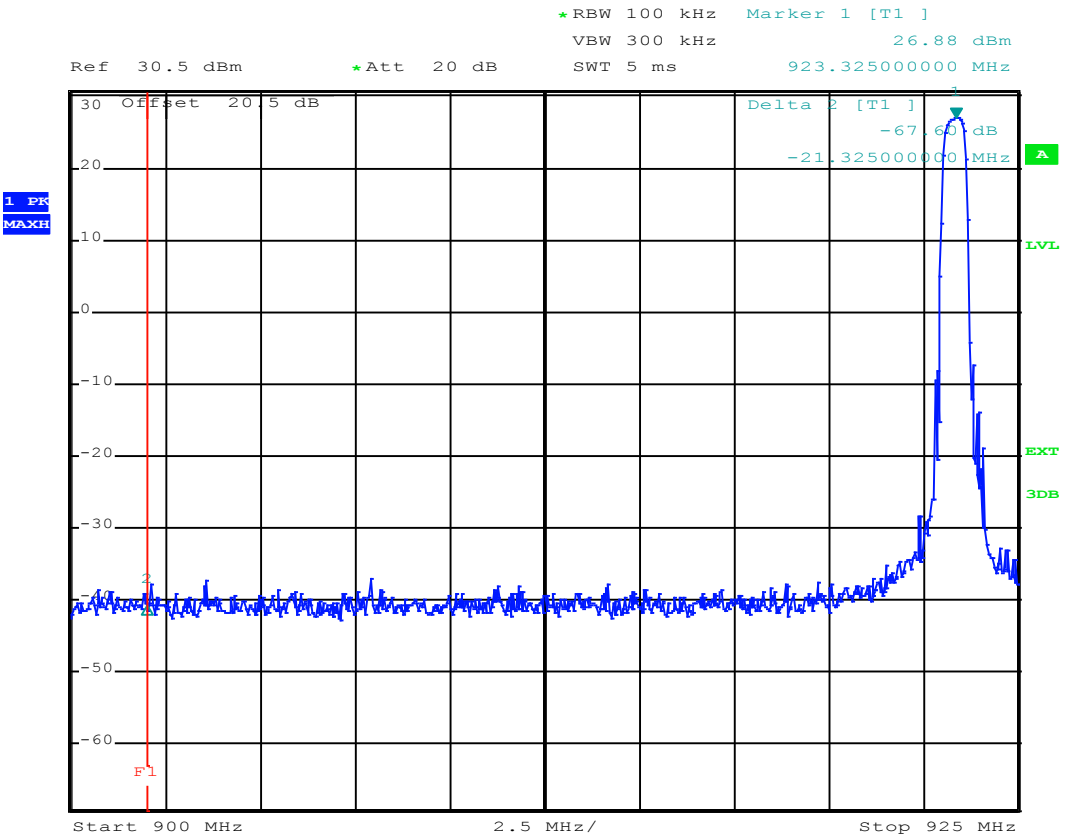


High channel

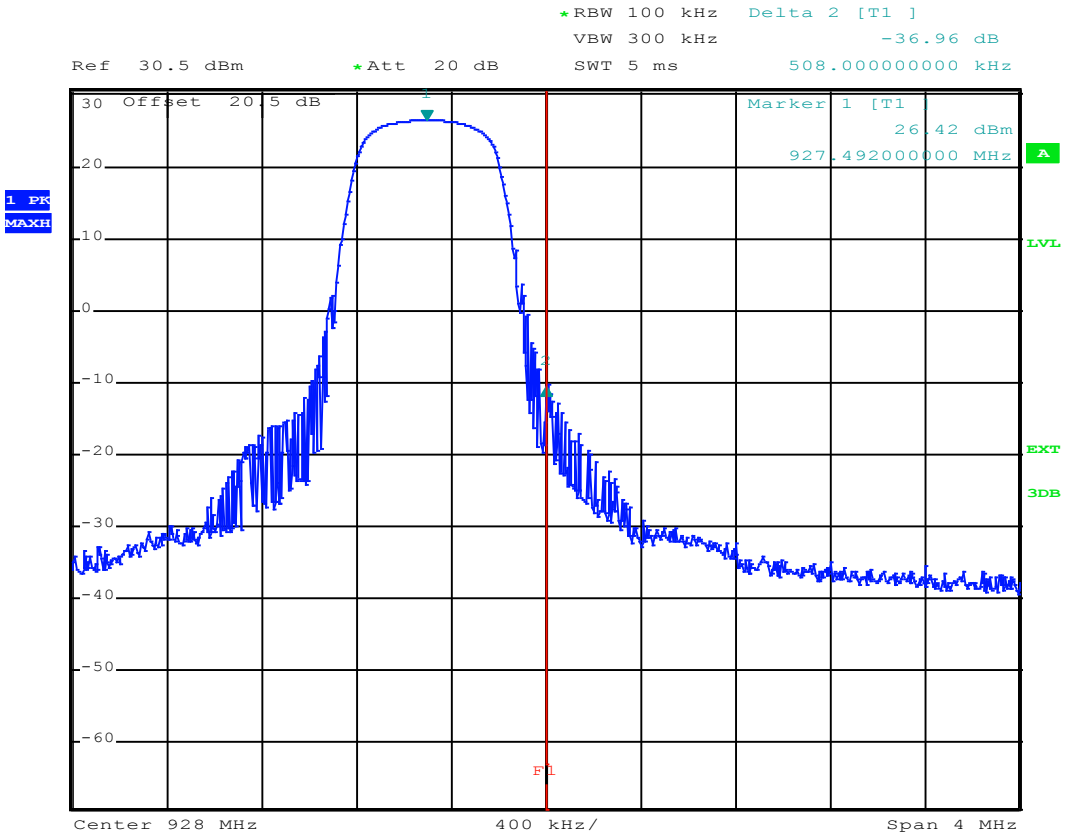


Spread Factor 12

Low channel



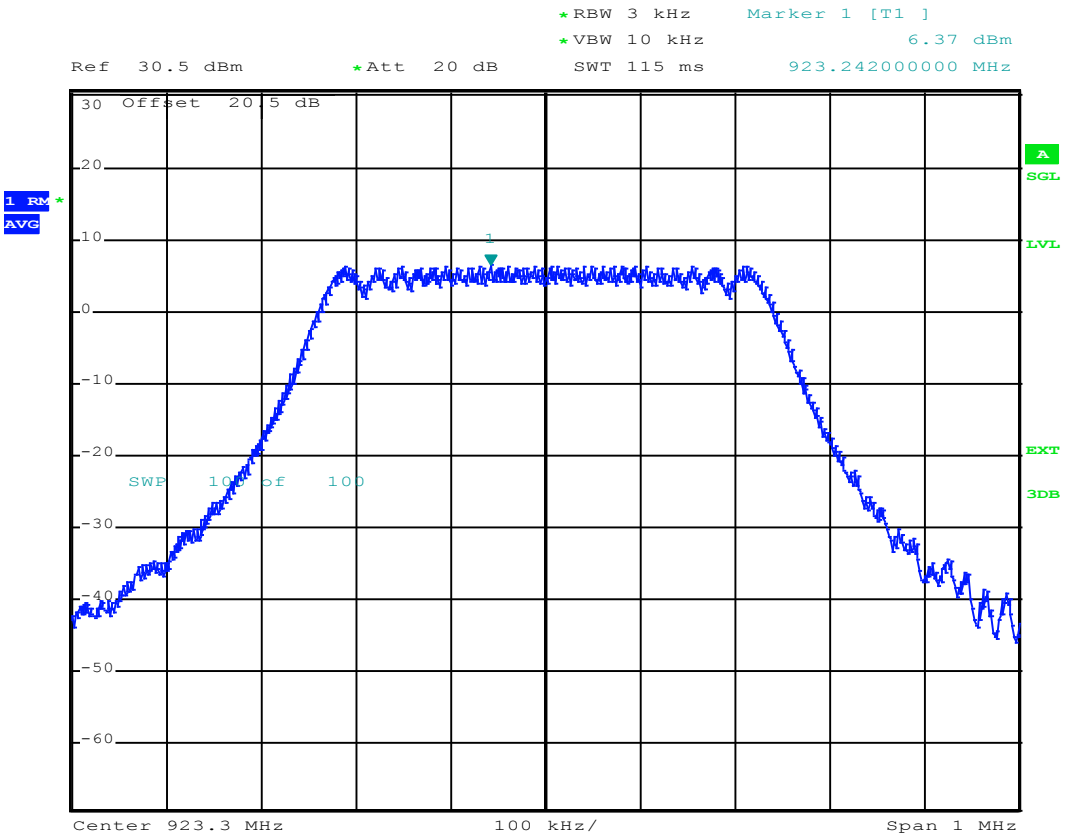
High channel



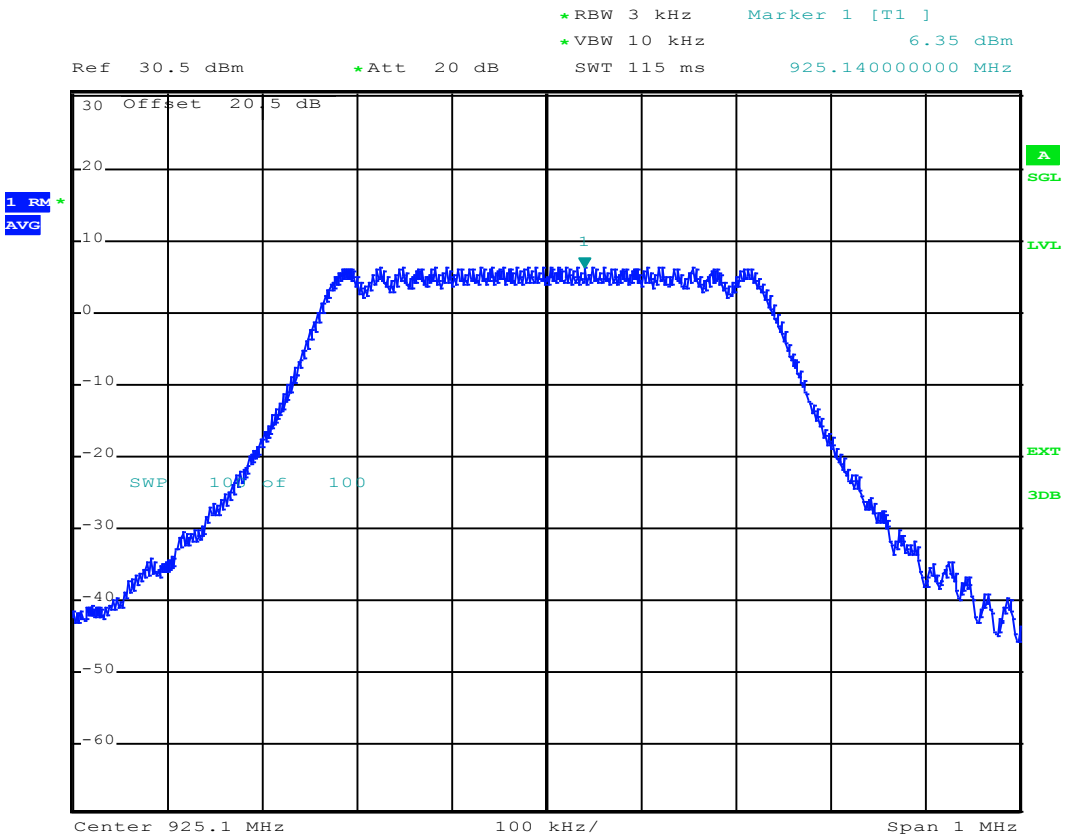
APPENDIX 8: Power spectral density

Spread factor 7

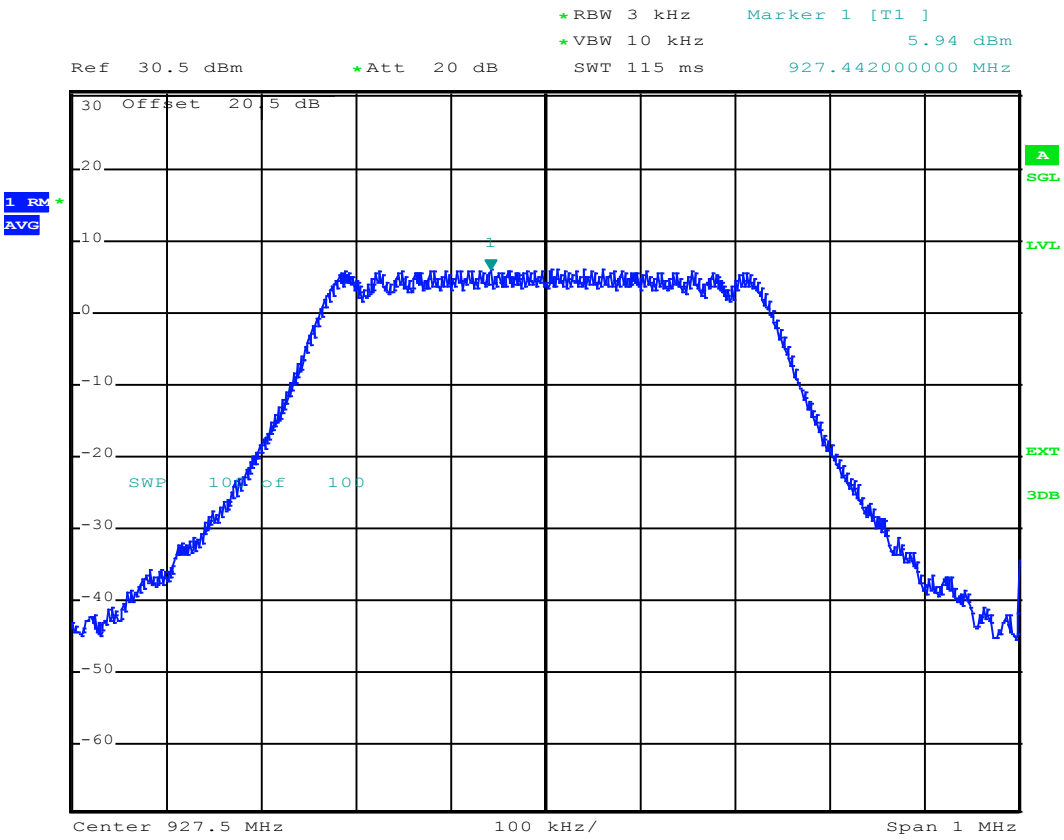
Low channel



Central channel

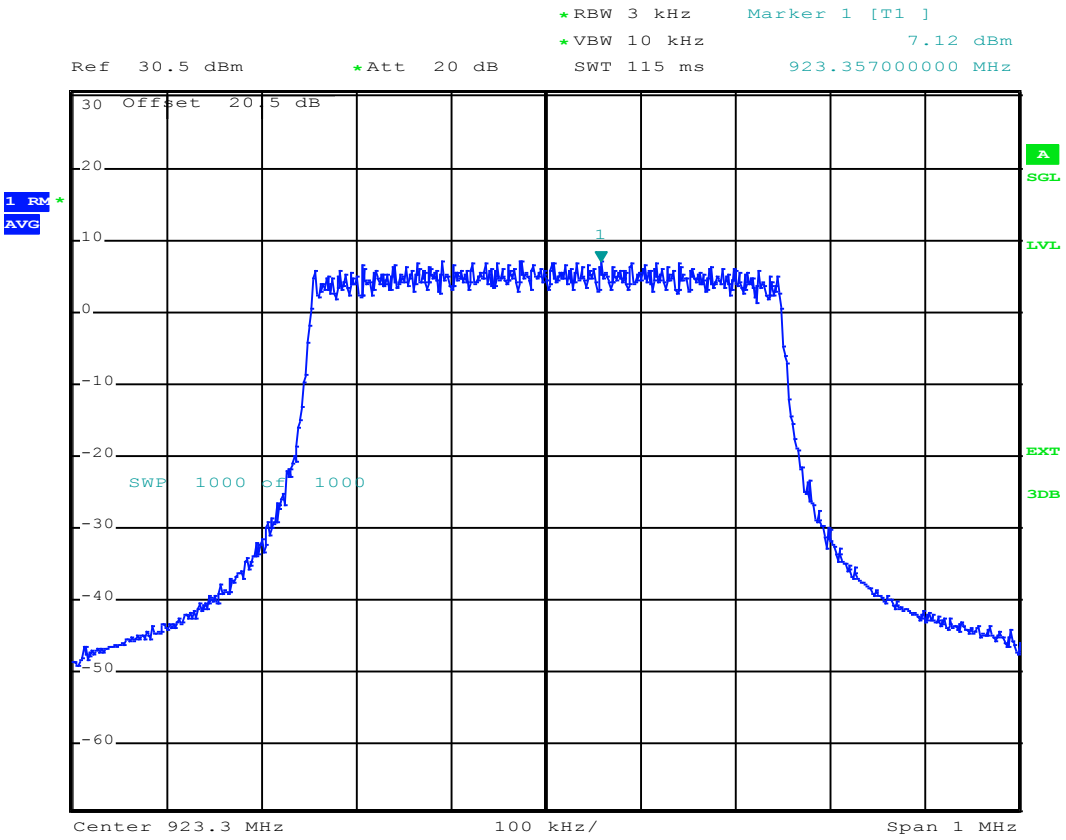


High channel

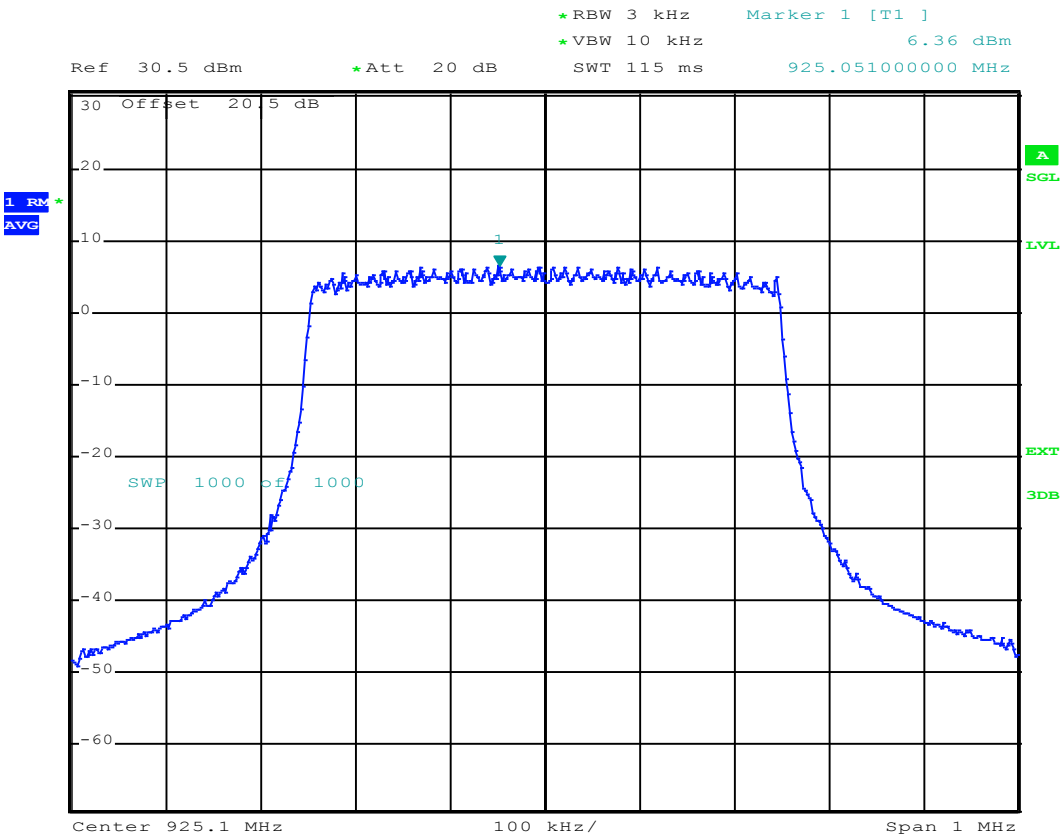


Spread factor 12

Low channel



Central channel



High channel